

Epiphan Pearl Nano



Release 4.14
February 26, 2021

UG122-15

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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

Overview of firmware release 4.14.0

Firmware 4.14.0 introduces Pearl Nano as the latest addition to the Pearl family. With many of the features you expect from a Pearl device, this powerful yet compact video recording and streaming encoder is a flexible, reliable, and affordable tool for live production, remote contribution, lecture capture, corporate communications, and more.

Firmware 4.14.0 is released exclusively for this first release of Pearl Nano and builds upon the underlying software code that's already used for our existing line of Pearl products. As such, we've included statements about any performance enhancements we've made that affect the underlying code and any applicable limitations and known issues with updates to reflect the current status of the firmware.

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Start here

Welcome, and thank you for buying Epiphan Pearl Nano™. You'll find all the information you need to set up and start using your system in this user guide. For a product description, see [What is Pearl Nano?](#).

See the [Quick start](#) for basic steps to get a single video source (and optional audio) set up so you can stream and record some output right away. The rest of the guide shows you how to tweak the system exactly how you want it so you can take advantage of the many advanced features.

Pearl Nano is fully integrated with Kaltura and Panopto Content Management Systems (CMSs) and is easily setup using the Admin panel. The Integration section of this guide details how to register and set up Pearl Nano as a remote recording and streaming device for Kaltura and Panopto.

For information about using Pearl Nano's RS-232 API, HTTP API, and HTTPS API with third-party applications, refer to the [Pearl System API Guide](#).

About this Guide

After the introductory section and quick start, the next chapter describes the main user interfaces that are used to operate and configure Pearl Nano. You'll find everything that you need to use and setup these interfaces :

- Front screen menu and control key interface
- Admin Panel

The rest of the user guide covers setting up and operating your Pearl Nano system for a successful experience. The chapters are organized into these main categories: [Setup](#), [Capture](#), [Stream](#), [Record](#), [Integration](#), [Maintenance](#), and [Troubleshooting](#).



What is Pearl Nano?

Pearl Nano is a versatile and easy to use, single channel video recording and streaming hardware encoder that's great for lecture capture, corporate communications, and remote video contribution applications using live SRT feeds.



With Pearl Nano, you can capture, record and stream computer monitors and other video sources, including:

- SDI
- HDMI™
- DVI-I (single link)
- SRT and RTSP

Simultaneously capture up to two audiovisual sources and arrange them in a custom layout with transparent images and backgrounds. Upgradable 4K HDMI and 12G SDI options coming soon.

Capture audio from dedicated XLR, USB, and RCA audio ports, as well as from SDI, HDMI, and network video sources (SRT and RTSP).

Stream to Content Distribution Networks (CDNs) worldwide using modern protocols SRT, HLS, and MPEG-DASH. At the same time, you can stream to other destinations using RTMP/RTMPS or RTSP. 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 Pearl Nano.



Download recordings using your web browser, or set Pearl Nano to automatically upload recorded files directly to a network server using FTP, RSYNC, CIFS, WebDav, and more. Pearl Nano is also fully integrated with Kaltura and Panopto Content Management Systems (CMSs) and can be registered as a video remote recorder resource for seamless lecture capture.

Network security compliance with 802.1x protocols, passwords, and certificate authentication means an easier setup for IT friendly live streaming over enterprise networks. HTTPS enabled for secure administration and control over the LAN, and RTMPS support for secure, encrypted live streaming.



Pearl Nano does not capture from HDCP encrypted sources.

Front and back view of Pearl Nano



Table 1 Pearl Nano front panel descriptions

Label	Name	Description
1	3.5 mm audio output jack	For audio confidence monitoring. Plays the audio for the currently visible channel.
2	SD card slot and LED indicator	Used to store up to 512 GB of recordings and user uploaded media files. For recommendations, see Tech specs . A small LED lights when Pearl Nano is powered on and an SD card is installed. If a SATA M.2 SSD is installed, the SD card slot is no longer detected and the LED indicator does not light.
3	Front screen display	Used for confidence monitoring and for displaying the front screen menu system and device information.
4	Control keys	Used to navigate the front screen menu system and select options when configuring system parameters using the front screen menu system.
5	Recording control key	Glows red when the device is recording. Flashing means that user action is required and recording has either stopped or won't start. Color is white when the system is powered on and not recording.
6	Streaming control key	Glows blue when the device is streaming. Flashing means that user action is required and streaming has either stopped or won't start. Color is white when the system is powered on and not streaming.



Table 2 Pearl Nano back panel descriptions

Label	Name	Description
1	12V DC power jack	Connect the power supply here to power on the device. The port requires a 12 V DC power source (center-positive). Always use the provided power adapter and tighten the screw lock securely onto the socket. To power down the unit, disconnect the power adapter from the device.
2	Cable lock	Allows Pearl Nano to be locked to a desk or surface using a laptop cable lock.
3	USB	A USB 3.0 (UAC) port for connection of external hard drives, flash drives, USB microphones, or supported USB status light indicators. Can be used to connect a USB mouse or keyboard when the local console feature is enabled. USB (UVC) devices are not supported.
4	HDMI OUT	An HDMI video output port, see Video output ports for details.
5	PoE+ (RJ-45 Ethernet)	Auto-sensing gigabit Ethernet 10/100/1000 Base-T network port with support for RTSP and SRT networked video inputs and PoE+ network power. See Configure network settings for setup instructions.
6	SDI	An SDI video input port that supports 3G SDI. Upgradable 12G option coming soon.
7	HDMI PASS-THROUGH	An HDMI pass-through port that outputs the HDMI IN signal with no added latency.

Label	Name	Description
8	HDMI IN	An HDMI video input port that supports up to 1920x1080 HDMI and DVI signals (using an adapter). Upgradable 4K option coming soon.
9	RCA	RCA consumer line-level stereo pair (left/right) audio inputs. See AV inputs .
10	XLR	Two XLR professional line-level, +4 dBu (balanced/unbalanced) jacks that can function as a stereo pair (left/right) or as two mono inputs. See AV inputs .

SD card and SATA M.2 2280 SSD storage

To record video using Pearl Nano, you need to install a storage medium. Pearl Nano has a standard SD card slot on the front panel that you can use, as well as a SATA M.2 2280 SSD storage expansion slot that's accessible from the underside.





Pearl Nano does not come with any storage medium installed. Adding a storage medium is not required if you're using Pearl Nano only for live streaming.

The storage medium must be EXT4 formatted for the Ubuntu operating system. The Ubuntu formatted SD card cannot be used to transfer files to iOS or Windows systems. Download recordings using the Admin panel or another method such as Automatic File Upload (AFU) to a connected USB device.

You can format the SD card from the front screen menu or using the Admin panel. The SATA M.4 SSD formats automatically the first time Pearl Nano is powered on after installing the SSD. For detailed instructions, see:

- [Format the SD card](#)
- [Install and format a SATA M.2 2280 SSD](#)

You cannot use an SD card and the SATA M.2 SSD at the same time. When you install the SSD, Pearl Nano no longer detects a previously installed SD card. Ensure recordings are downloaded from the SD card before installing the SSD.



When you install a SATA M.2 SSD, Pearl Nano no longer detects the SD card slot and the SD card option is removed from the Admin panel's Configuration menu.

When the storage medium is full, new recordings overwrite the oldest recordings. If you're using Pearl Nano with a Content Management System (CMS), we recommend using large capacity storage mediums such as an SD card that's 256 GB or more, see [CMS recording and webcasting control on Pearl Nano](#).

For important considerations when setting the maximum file size limit and recording to the storage medium, see [About recording](#).

SD card recommendations

For the SD card, we recommend using a minimum class 10 (C10) SD card that's at least 64 GB capacity but does not exceed 512 GB; however, most SD cards that are at minimum a C10, a UHS class 1 (U1), or a video speed class 10 (V10) should work.

Do not eject the SD card while recording is in progress as that may corrupt the SD card.

Quick start

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

Before you begin, make sure you have:

- A video source such as a camera or computer and cables to connect them to Pearl Nano. 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 or the USB (UAC) port can be used.
- 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 Nano and the admin computer to the network.
- An SD card so you can record video using Pearl Nano right away. We recommend an SD card that is at least a class 10 with up to 512 GB of capacity, see [SD card and SATA M.2 2280 SSD storage](#).

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

Starting up

Pearl Nano is pre-configured with a no fuss Auto channel, which makes it possible to connect a video source and start recording right away to the EXT4 formatted SD card that you install.

When you first start Pearl Nano, the pre-configured Auto channel behaves as follows:

- If you connect an HDMI video source to the HDMI IN port, the Auto channel automatically uses the HDMI video and embedded HDMI audio.
- If you connect an SDI video source to the SDI port, the Auto channel automatically uses the SDI video and embedded SDI audio.
- If both HDMI and SDI video sources are connected, the HDMI video source and embedded audio takes priority and is used in the Auto channel by default.
- If no video sources are connected, a standard No Signal screen displays.

The Auto channel's frame size is set to match the video source by default and the best bit rate for the default frame rate of 30 fps is applied automatically.

Start up Pearl Nano for the first time


1. Turn on your camera or video source and connect the output to the **HDMI IN** port on the back panel of Pearl Nano.



2. (Optional) Connect a video source to the SDI port.
3. Connect the Ethernet cable to Pearl Nano and to your network. If your network supplies PoE+ power, then you can skip the next step to connect the power adapter. Pearl Nano will power up using the power from the Ethernet cable.



4. Connect the power adapter cable and finger tighten the screw ring securely. Then plug the other end into a power source.

 If your network supplies PoE+ power, then you can skip this step.

5. Wait for the power-up cycle to complete and the Auto channel to appear on the front screen.

If your video source has a signal, the video displays on the front screen. If you don't see the Auto channel displayed on the front screen, press the **left arrow** key on the control key interface to cycle through the different views.



- 6. (Optional) Plug headphones into the 3.5 mm headphone jack at the front of Pearl Nano to monitor the video signal's embedded audio. For more about monitoring audio, see [Monitoring audio](#).

Install and format an SD card

To record video, you must install and format a storage medium, such as an SD card. The easiest way to do that is using the front screen menu and the control key interface on the front panel of Pearl Nano. If you want to format the SD card using the Admin panel, you need the IP address of your Pearl Nano and an admin computer connected to the same network. See [My network IP address and access to the Admin panel](#).



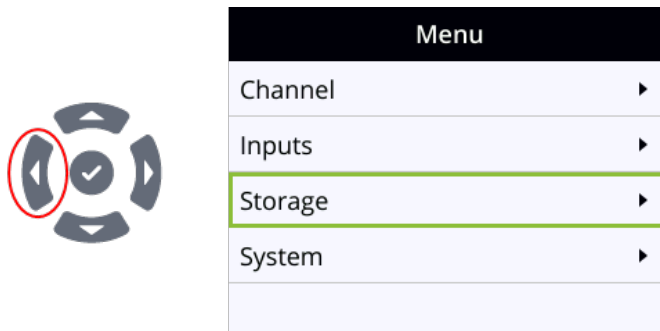
After the SD card is installed and formatted for the EXT4 format, simply press the **Record** key on the front panel to start and stop recording the channel. Recordings are saved to the SD card by default.

STOP Ejecting the SD card while recording is in progress may corrupt the SD card and cause loss of data.

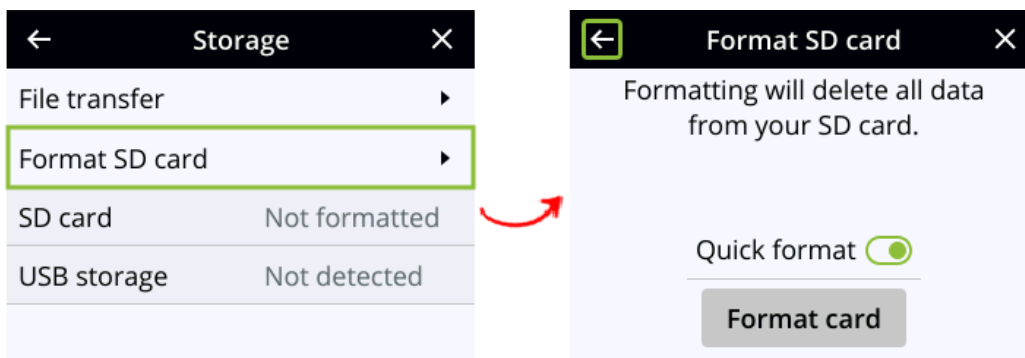
STOP If you install a SATA M.2 2280 SSD, Pearl Nano no longer detects the SD card, see **Install and format a SATA M.2 2280 SSD**.

Format an SD card using the front screen menu and control keys

1. Power on the Pearl Nano device.
2. Insert the SD card into the SD card slot.
3. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



4. Use the arrow and check mark keys to select **Storage**. Then from the Storage screen, select **Format SD card** to open the Format SD card screen.



5. (Optional) Highlight **Quick format** and press the **check mark** key to toggle the switch on or off.
6. Highlight **Format card** and press the **check mark** to start the process. The formatting in progress screen appears and the LED beside the SD slot starts flashing.
7. When the screen indicates formatting is complete and the LED is solid off, press the **check mark** to return to the previous screen.

Your first recording

When you power up Pearl Nano, you can start recording as soon as you connect a video source to one of the video input ports and have a formatted SD card installed.

Record the default Auto channel using the Record control key

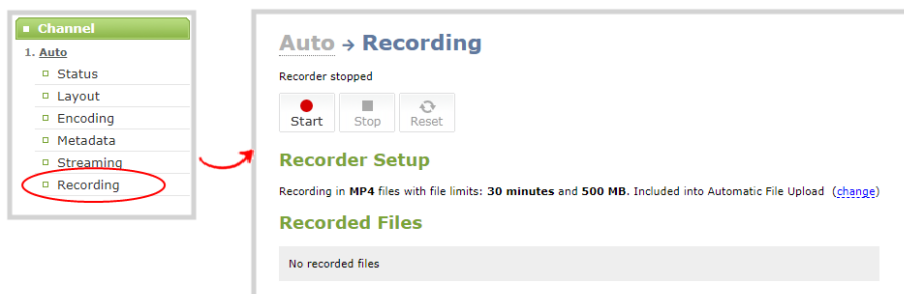
To record the default Auto channel using the control key on the front panel of Pearl Nano, simply press the **Record** key. When you're done, press the **Record** key again to stop. The Record key is lit red while recording is in progress.



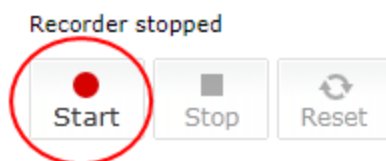
Record the default Auto channel and download the file using the Admin panel

The SD card uses the EXT4 format and you cannot manually transfer recordings off the SD card directly to iOS or Windows systems. Instead, download your recording using the Admin panel .

1. Open a web browser on the admin computer and go to the IP address of your Pearl Nano and log in, see [My network IP address and access to the Admin panel](#).
2. From the **Channel** menu in the Admin panel, select your channel (i.e. Auto) and select **Recording**. The Recording page for the channel opens.



3. Select **Start** to start recording the channel and click **Stop** when you're done.



4. Refresh the page to see the newly recorded file appear in the Recorded Files list.
5. Select the file in the list and download that recording to your admin computer.

My network IP address and access to the Admin panel

You can get the network IP address of your Pearl Nano from the front screen menu. With the device IP address, you can access the Admin panel to do things like configure Pearl Nano, format the SD card, start/stop recording and more. Just make sure that your admin computer is connected to the same network as Pearl Nano and that the network uses DHCP.



If your network requires you to assign Pearl Nano a static IP address instead of using DHCP to obtain one, contact your network administrator and see [Connect using persistent static IP address](#).

Obtain the IP address of Pearl Nano and access the Admin panel

1. Press the **left arrow** key repeatedly on the control key interface until the System status screen appears.

System status	
IP address	10.113.1.101
Firmware	4.14.0i
Uptime	07:22
CPU load	9%
SD card	111 GB of 111 GB
USB storage	Not detected

2. Using a browser on the admin computer, enter the URL to login to the Admin panel .

`http://<IP Address for Pearl Mini>/admin`

For example: `http://192.1.10.100/admin`

3. When prompted, login using the default user name **admin**. No password set by default.
4. (Optional) Open a new tab in your browser and enter the URL to preview a channel.

`http://<IP Address for Pearl Nano>/preview.cgi?channel=1`

For example: `http://192.1.10.100/preview.cgi?channel=1`

If a password has been set for the Admin panel, consult with your system administrator for the login credentials and see [User types and privileges](#). For more details about accessing the Admin panel, see [Connect to Admin panel](#).



For higher security, we recommend setting admin, operator and viewer-level passwords on Pearl Nano, see **Set or change user passwords**.

What's Next?

Now that you have a video source connected and an SD card installed and formatted, you can fine-tune Pearl Nano to your exact requirements. Take a look at topics such as:

- [What is a channel?](#)
- [Custom layout configuration](#)
- [What is streaming?](#)
- [Selecting an audio source](#)
- [Video output ports](#)
- [FTP and automatic file transfers](#)

When you're done setting up your Pearl Nano, make sure to back up the system configuration using the procedure described in [Create a configuration preset](#).

Register Pearl Nano to get firmware updates

Keep Pearl Nano up-to-date and get all the latest features and firmware updates. Registering your Pearl Nano is free and only needs to be done once. You can register anytime from the Firmware update page using the Admin panel, see [Register your device](#)

Monitoring audio

Pearl Nano's 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 front screen. The audio you hear depends on the audio source configured in the live channel layout.



Adjust the volume

From the Channel view or when one of the video sources is displayed on the front screen, press the up and down arrow keys on the control key interface to adjust the volume. Each press changes the volume by 10% to a maximum volume of 100%. Turn the volume all the way down to mute.



You can also adjust the volume using the front screen menu when you select **System > Controls > Headphone volume**.

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

Audio VU meter

A VU meter on the front 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.

VU meter (mono)	
VU meter (stereo)	

Table 3 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:

- **Front screen:** On the channel view and on each of the video input screens.
- **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](#).

Selecting an audio source

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, SRT, and RTSP), as well as from the dedicated analog audio input ports. The USB port accepts a USB (UAC) microphone.

Dedicated analog audio inputs ports are:

- Two 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)

The XLR audio inputs are configured as a stereo pair by default: XLR 1 (left) and XLR 2 (right), see [Configure audio ports for stereo or mono](#). The XLR audio ports and the RCA audio ports are linked. You can configure Pearl Nano to use both or just one of the audio sources using the Admin panel, see [Assign audio sources to an input](#).

This table offers some guidelines for adjusting the gain of the XLR and RCA analog audio input ports, as well as the USB port. 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 4 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
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 .

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

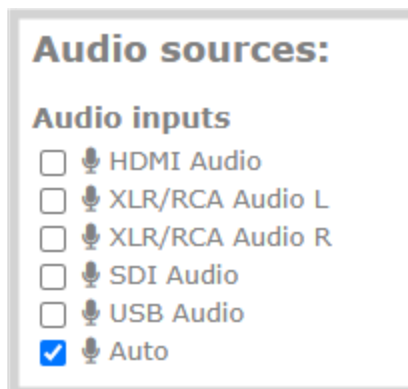
Choose a different audio device for the channel using the Admin panel

1. Using a web browser on the admin computer, go to the IP address of your Pearl Nano and log in, see [Connect to Admin panel](#).
2. From the Channel menu, click **Layouts**. The custom channel layout editor page opens.



Audio for the Auto channel is 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 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 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:

- [AV inputs](#)
- [Tech specs](#)
- [Power adapter specifications](#)
- [Optimum CPU performance](#)
- [Vesa mounting the device](#)
- [International character support](#)

AV inputs

We recommend having up to two video sources added to the custom layout in Pearl Nano's single, full HD channel.

One of the video sources can be either an SRT or an RTSP networked source; however, you cannot connect more than one networked source at the same time. Pearl Nano supports use of common signal converters and input adapters.

Table 5 Pearl Nano Input Ports

Input port	Qty	Details
SDI¹	1	Linear PCM audio/video input. Supports 3G SDI video input. Upgradable 12G SDI option coming soon.
HDMI™	1	Linear PCM audio/video input, non-HDCP protected. DVI-I (using an adapter) is single link. Supports 1920×1080 full HD video input. Upgradable 4K option coming soon.
USB 3.0	2	Linear PCM audio inputs on the rear panel accept non-HDCP protected content. Use to connect a single UAC device, such as a USB microphone. Can also connect to external hard drives, flash drives, and control interfaces. USB (UVC) devices are not supported.
RJ-45	1	One SRT source over Ethernet at 1920×1080@30 fps.
		One RTSP source over Ethernet at 1920×1080@30 fps.
RCA²	2	RCA consumer line-level audio inputs function as a stereo pair (-10

Input port	Qty	Details
		dBV). <ul style="list-style-type: none"> • White = left • Red = right
XLR²	2	Two XLR audio inputs operate as a stereo pair (left/right) by default. <ul style="list-style-type: none"> • XLR 1 = left • XLR 2 = right You can configure the ports to operate as independent mono inputs using the Admin panel, see Configure audio ports for stereo or mono . XLR inputs accept balanced and unbalanced, professional line level signals with a maximum of up to 12.3 VRMS, +24 dBu.

¹ SD-SDI audio is not supported.

² In the Admin panel, XLR/RCA includes audio signals from the XLR 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](#).

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



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

Tech specs

The input and output connectors are listed for Pearl Nano.

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

Table 6 Specifications for Pearl Nano

Video inputs	Local video inputs	(1) 3G SDI ¹ (2) HDMI™ 2.0 ²
	Video over Ethernet ³	(1) RTSP (1) SRT (push)

	Connectors	(1) BNC (female) (1) HDMI type A (female) (1) RJ-45 (female)
	Aspect ratios	3:2, 4:3, 16:9, 16:10, and custom aspect ratios
	Standard resolutions	PAL, PAL wide, NTSC, NTSC wide
	Resolution range	640×480 to 1920×1200
	Frame rate	Up to 60 fps
	Input color spaces	HDMI: RGB 4:4:4, YC _R C _B 4:2:2, YC _R C _B 4:4:4 SDI: RGB 4:BNC4:4, YC _R C _B 4:2:2
	Interlacing	Yes
	Maximum cable length for 3G SDI	300 ft
	Maximum cable length for USB 3.0	6 ft
	Audio inputs	Analog audio inputs
Connectors		(2) XLR (female) (2) RCA (female)
Digital audio inputs ⁴		(1) SDI ⁵ (1) HDMI (1) USB (1) RTSP (embedded over Ethernet) (1) SRT (embedded over Ethernet)
Connectors		(1) BNC (female) (1) HDMI type A (female)

		(1) USB-A (female) (1) RJ-45 (female)
	Gain control	0 dB to +30 dB
	Mute	Yes
	Configurable audio delay	-300 ms to +300 ms
Video processing	Video output color space	4:2:0, 8 bits per color
	Video codec	H.264/AVC (ITU H.264, ISO/IEC 14496-10) 4:2:0, 8 bit color <ul style="list-style-type: none"> • Encoding profile: High, Main, Baseline • Profile levels: 3.0, 3.1, 3.2, 4.0, 4.1, 5.1
	Bitrate	1 to 50 Mbps (selectable)
	Bitrate control	Constant
	Hardware accelerated video encoding	Optional
	Video scaling	Software and hardware
	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	(1) HDMI 2.0 (port 1) (1) HDMI 2.0a pass-through (port 2) (1) H.264/AVC digital video over Ethernet (1) RTSP (1) SRT (push)

		(1) HLS (push) (1) MPEG-DASH (push)
	Connectors	(2) HDMI (1) RJ-45 (female)
	Streaming protocols	MPEG-TS, and FLV RTSP over TCP/UDP RTMP/RTMPS SRT (push) over UDP HLS (push) over HTTP/HTTPS MPEG-DASH (push) over over HTTP/HTTPS HLS (pull) - Native Apple HTTP/HTTPS stream for iPad, iPhone and iPod Touch
	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 MPEG-DASH: MD5, SHA-256, and SHA-512 RTMPS: encryption plus CA certificate negotiation
	Resolution ranges	Recorded: 480p to 1920×1200p Streamed: 480p to 1920×1200p HDMI output ports: 480p to 1920×1200p
	Frame rate	Up to 60 fps
	Formats	H.264/AVC (ITU H.264, ISO/IEC 14496-10) 4:2:0, 8 bit color <ul style="list-style-type: none"> • Encoding profile: High, Main, Baseline • Profile levels: 3.0, 3.1,3.2,4.0,4.1

Audio output	Analog audio output	(1) 3.5 mm stereo headphone jack
	Digital audio outputs	RTSP and SRT audio over Ethernet HLS and MPEG-DASH audio over HTTP/HTTPS HDMI audio (embedded)
Monitor and control	Front screen	2.2 inch screen monitor (built in) resolution: 320x240
	Control key interface	Front panel control keys and multi-function keys
	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
	File upload formats	JPEG, PNG
	SD card	Up to 512 GB ^{6, 7}
	File system for SD card	EXT4
	Internal storage	SATA M.2 2280 SSD storage ⁶ (M Key connector)
	File transfer protocols	FTP, SFTP, SCP, AWS S3 client, and WebDAV client RSync
	Network file share protocols	CIFS/SMB
	File system for USB storage	FAT16, FAT32, XFS, EXT2, EXT3, EXT4, NTFS
	External USB port	(1) USB 3.0 (UAC)
	Bitrate	Up to 50 Mbps
Communication	USB standards	USB 1.1, USB 2.0, and USB 3.0 HDCP compliant

	Serial port	(1) Bidirectional RS-232 (via a USB to serial adapter)
	Serial 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 Transmission Unit	68 to 1500 MTU (configurable)
	Protocols	DHCP Option 81, TLS 1.2, LDAP, mDNS, DDNS, UPnP, 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	UPnP, SAP
	Network security	802.1x EAP methods
Administration and control	Admin panel	<p>Local web UI for full administration. On-screen display and mobile UI for confidence monitoring, administration, and control.</p> <p>Local Admin panel access using an external monitor and a USB mouse or keyboard connected directly to Pearl Nano plus front screen monitor support.</p>
	Epiphan Cloud	Cloud-based platform to remotely manage and control Pearl Nano devices. Start and stop recording/streaming, monitor sources 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 access, as well as local network

		access to the live channel broadcast.
	Remote access:	Remote login ⁸ to the cloud version of the Admin panel.
	API	Yes (HTTP/HTTPS or RS-232)
	Crestron driver	Yes See https://applicationmarket.crestron.com/epiphan/
Integrations	Content Management Systems	Kaltura Panopto
	Cloud access and management	Epiphan Cloud
AC/DC power adapter	Model	SYS1588-3012
	Input power rating	90 to 240 VAC, 1.5 A _{RMS} , 47 to 63 Hz
	Output power rating	12 VDC, 2.5 A, 30 W
	Active efficiency (average):	87.7%
	Efficiency (10% load):	86.5%
	No load consumption:	0.1 W
	Power adapter manufacturer	Sunny Computer Technology Europe, s.r.o Trnkova 156, 628 00 Brno Czech Republic

General	Operating temperature	32° to 104° F (0° to 40° Celsius)
	Cooling	Fan air flow: Left to right
	Enclosure	Metal
	Form factor	Portable desktop model, VESA mountable
	Dimensions (W × D × H)	1.13" × 5.91" × 1.69" (206 mm × 150 mm × 43 mm)
	Weight	2.0 lbs (907 kg)
	Power supply	External AC/DC power adapter: 90 to 240 VAC/12 VDC, 2.5 A, 47 to 63 Hz PoE+ (802.3at)
	Input power rating	External AC/DC power adapter: 12 VDC, 1.5 A _{RMS} , 34 W PoE+ (802.3at): 44 to 57 VDC, 25.5 to 30 W
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	

¹Upgradable 12G SDI coming soon.

²HDCP compliant.

³One of the video sources you connect can be either an RTSP or an SRT source; however, you cannot connect more than one of these sources at the same time.

⁴Digital audio is de-embedded from the digital source.

⁵SD-SDI audio is not supported.

⁶User supplied.

⁷SD card is reserved for system use and cannot be used to transfer files to other devices like a laptop. Use a USB memory device to manually transfer files instead.

⁸Requires an Epiphan Cloud Pro account.

Power adapter specifications

An AC to DC power adapter model SYS1588-3012 comes with your Pearl Nano.

Table 7 AC to DC power adapter SYS1588-3012 specifications

Parameter	Value
Input voltage	90-240 VAC
Input AC frequency	47 to 63 Hz
Output voltage	12 VDC
Output current	2.5 A
Output power	30 W
Active efficiency (average)	87.7 %
Efficiency (10 % load)	86.5 %
No-load consumption	0.1 W
Manufacturer	Sunny Computer Technology Europe, s.r.o Trnkova 156, 628 00 Brno, Czech Republic

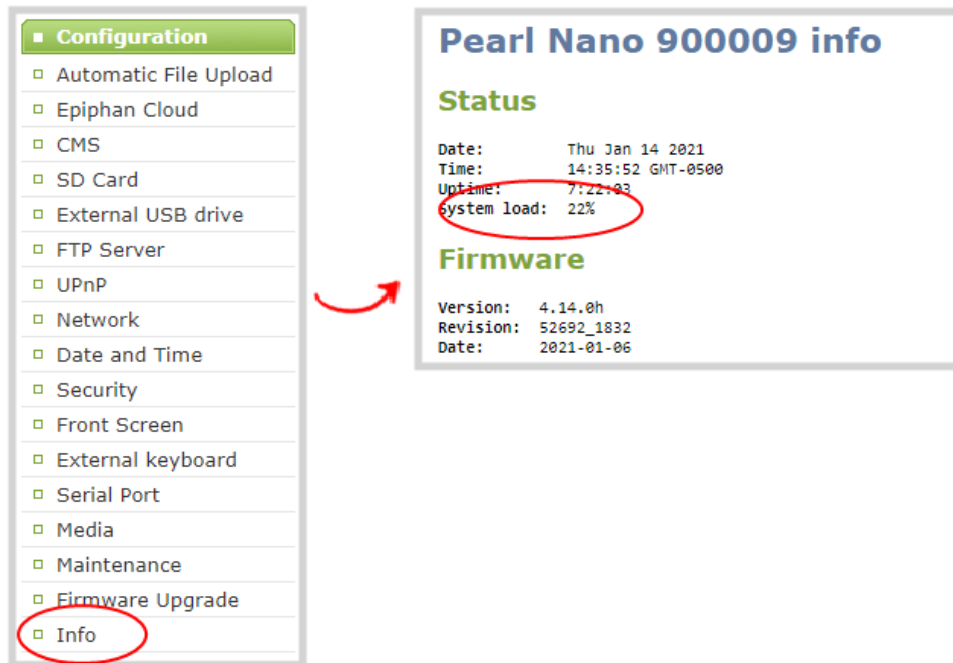
Optimum CPU performance

Pearl Nano is a dedicated single channel video encoder, recorder, and hardware streaming device; however, there's a limit to the number of concurrent tasks the onboard CPU can perform efficiently.

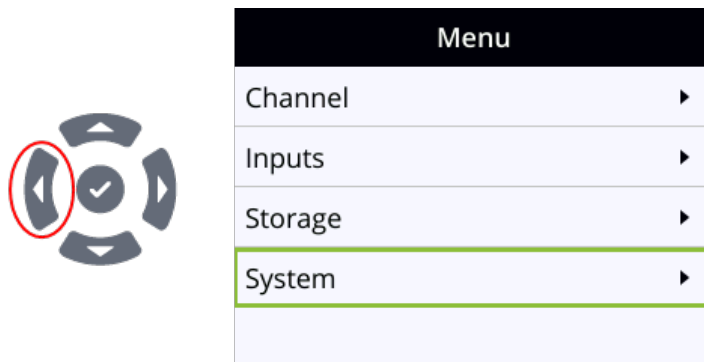
The number of concurrent tasks depends on many factors, like the number of video sources, what frame rate and bitrate is used for the channel, if the video output port used, etc. Keep in mind that connecting a live monitor to the HDMI output port consumes about the equivalent of an encoded 1920×1080@30 fps channel.

For best results, we recommend keeping Pearl Nano's CPU usage under 70%.

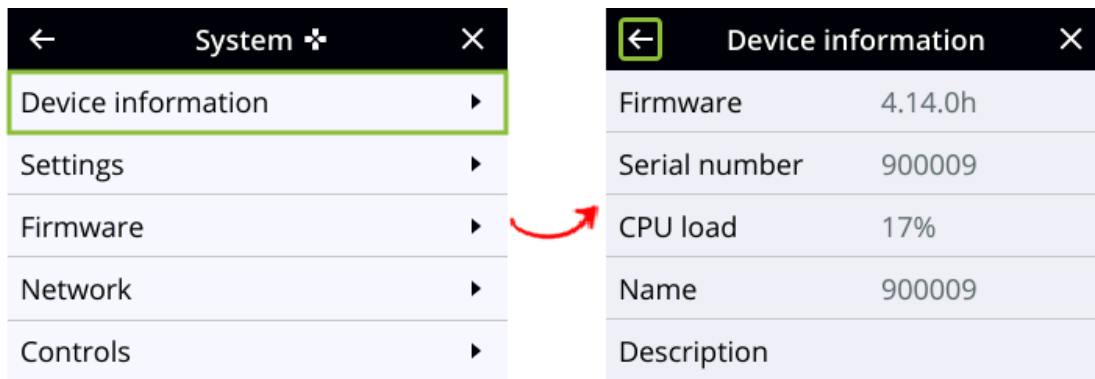
You can check the **Overall system load** from the **Info** page using the Admin panel.



To check the CPU usage from the front screen menu, repeatedly press the **left arrow** key on the control interface until the Menu screen displays.



Use the arrow and check mark keys to select **System**, and then select **Device information** to display the Device information screen.



If the system load is higher than recommended, you can disable the video output port (if unused).

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.

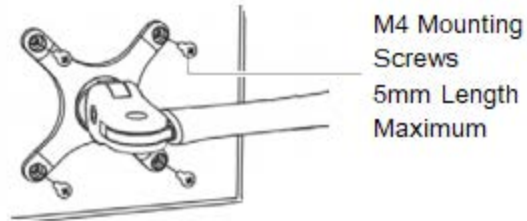
Important considerations

- 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 Nano 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 Nano replaces special characters with an underscore.

Vesa mounting the device

The rear panel of Pearl Nano has vesa mounting holes to fit a standard, 75mm × 75mm vesa mount. Use four M4 screws with a maximum length of 5mm to mount the plate to the rear panel of Pearl Nano.

75mm x 75mm Hole Pattern



Do not insert screws longer than the recommended 5mm. Using longer screws can damage the device.

User interfaces and remote access

Pearl Nano has several user interfaces:

- **Front screen and control keys:** Easily accessible on the front panel of Pearl Nano, the front screen and control key interface are primarily used for easy device setup and confidence monitoring, see [About the front screen and control key interface](#).
- **Admin Panel:** A web-based user interface that's primarily used to perform system set up and administrative tasks for your Pearl Nano. 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 Nano, or locally using a USB mouse, keyboard, and monitor connected directly to Pearl Nano. See [About the Admin panel](#).

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

The front panel control interface

The front screen and control key interface on Pearl Nano has many functions, including confidence monitoring, starting and stopping recording and streaming, configuring settings using the front screen menu, loading configuration presets, viewing system information and more.

Topics include:

- [About the front screen and control key interface](#)
- [The front screen Channel view](#)
- [The front screen menu and control keys](#)
- [Record and stream using the control keys](#)
- [Dim the front screen and control interface](#)
- [Set the front screen timeout](#)
- [Set a PIN security code](#)

To view system information using the front screen, see [View system status using the front screen menu](#)

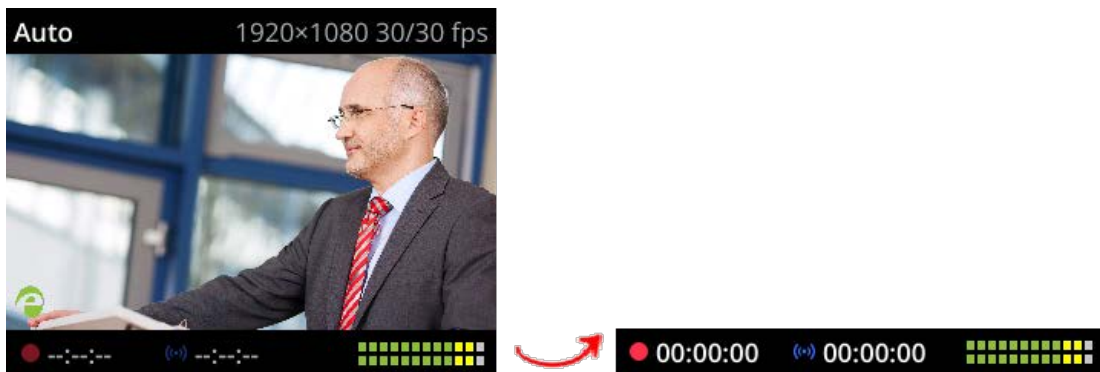
To select the video source for the output port using the front screen when local console is enabled, see [Select the video output source using the front screen menu](#).


To start and stop scheduled and ad hoc events for Kaltura and Panopto using the front panel control interface, see [Stop/start scheduled CMS events using the front screen menu](#).

About the front screen and control key interface

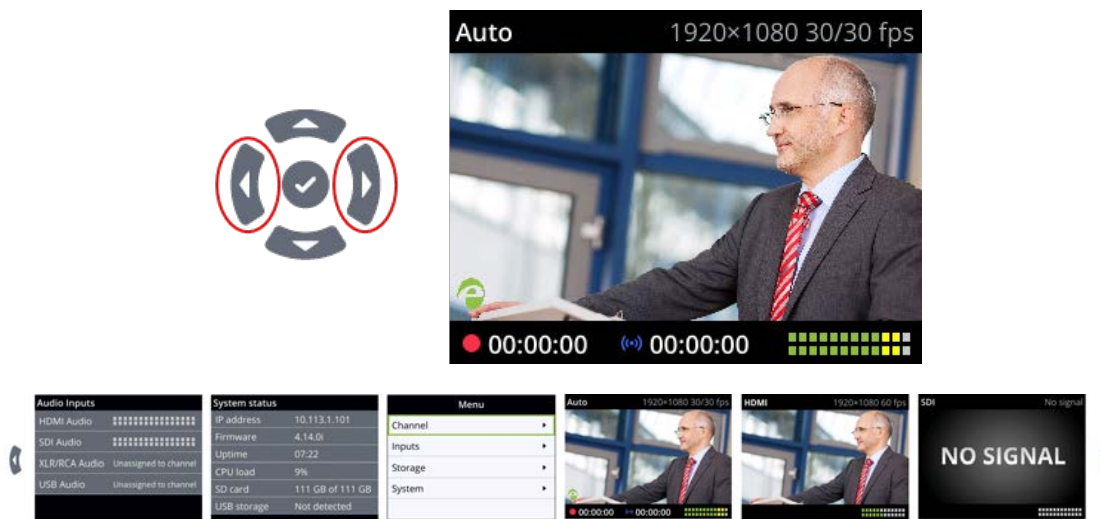
Pearl Nano's front screen and control key interface has multiple uses, including: confidence monitoring, basic configuration, diagnostics, plus quick access streaming and recording control.

When you power on Pearl Nano, the Channel view displays the Auto channel by default. In this example, the auto channel shows a video source that is connected. Dashes in the footer indicate there is no record medium installed yet (i.e. no SD card or SATA M.2 SSD installed) and no streams are configured for the channel. Otherwise, the record and stream timers would appear at the bottom of the screen.




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



If you don't see the Channel view displayed on the front screen, press the **left arrow** key (or the right arrow key) on the control key interface to cycle through the different views. You can use the control keys to change views on the front screen and navigate the front screen menu. Pressing the **check mark** key selects a highlighted menu option.



The Record and Stream control keys on the front panel are used to start and stop recording or streaming, respectively. Their color and brightness change under different conditions.

Table 8 Front panel record and stream control key conditions

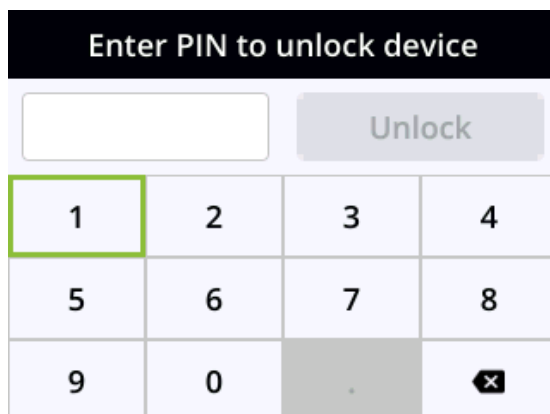
Icon	Description
	Record control key used to stop and start recording the channel.

Icon	Description
	<ul style="list-style-type: none"> • Glows solid white when an SD card (or SATA M.2 SSD) is installed and formatted. • Glows solid red when the channel is actively recording. • Flashes red on/off if there is an error while recording. • Solid off (white) when no storage medium is installed and formatted, or when Pearl Nano is powered off.
	<p>Stream control key used to stop and start streaming the channel.</p> <ul style="list-style-type: none"> • Glows solid white when a stream is configured for the channel. • Glows solid blue when the channel is actively streaming. • Flashes blue on/off if there is an error while streaming. • Solid off (white) when no stream is configured for the channel or when Pearl Nano is powered off.

A default No Signal screen appears if no video sources are connect to Pearl Nano for the Auto channel to pick up. The No Signal screen also appears if the channel's layout does not include the video source when the Auto channel has been renamed and is no longer functioning as an automatic channel.



By default, full access to the front screen and control interface is enabled. To control access to the front screen and control interface, you can set a PIN using the Admin panel. When a PIN is set, the front panel controls are locked. Users must unlock the screen to access the different views on the front screen and to start/stop streaming or recording using the Record and Stream control keys.



A virtual keyboard for entering the PIN appears on the front screen; however, you can connect an external USB keyboard if Pearl Nano is configured to allow that.

Related links

- [The front screen Channel view](#)
- [The front screen menu and control keys](#)
- [Record and stream using the control keys](#)
- [Dim the front screen and control interface](#)
- [Connect an external keyboard](#)

The front screen Channel view

After you power on Pearl Nano, the Channel view displays automatically. If you don't see the Channel view displayed on the front screen, press the **left arrow** key on the control key interface to cycle through the different views.



You can hide the header and footer bars on the Channel view by pressing the **check mark** key. Press the **check mark** key again to show the header and footer bars.

Table 9 Parts of the front screen for the Channel view

Item	Description
1	Channel resolution and frame rate.
2	Channel name.
3	Preview of the channel video source used for confidence monitoring. If no video source is connected or there is no video signal, the default No Signal screen displays.
4	Recording indicator and timer. The recording timer shows the length of time that recording has been in progress. If dashes appear in place of the timer, there is no SD card or SATA M.2 SSD installed and formatted.
5	Streaming indicator and timer. The streaming timer shows the length of time that streaming has been in progress. If dashes appear in place of the timer, there are no streams configured for the channel.

Item	Description
6	<p>Audio VU meter using quasi-peak ballistics with samples averaged every 10 ms. The maximum average audio level in each 100 ms period is displayed using colored bars.</p> <ul style="list-style-type: none"> • RED = 0 to -9 dBFS • Yellow = -9 to -18 dBFS • Green = -18 dBFS and lower

The front screen menu and control keys

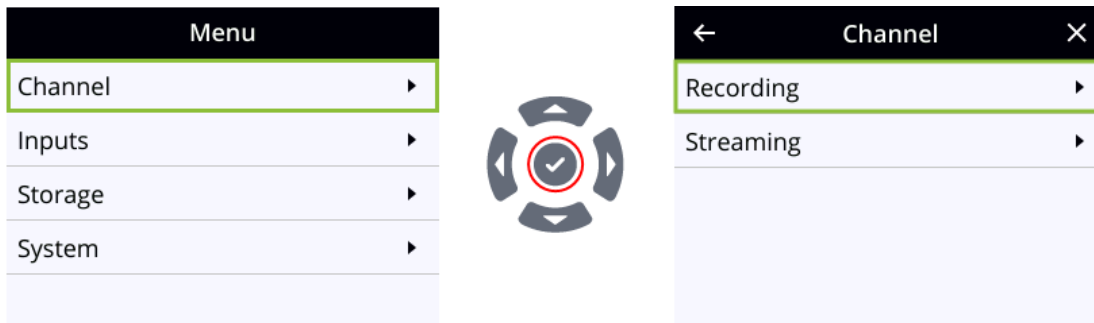
The front screen menu lets you view Pearl Nano settings and do basic configuration, like setting a static IP address and choosing which video source appears on the HDMI OUT port. The control key interface on the front panel lets you change views on the front screen and navigate the front screen menu.



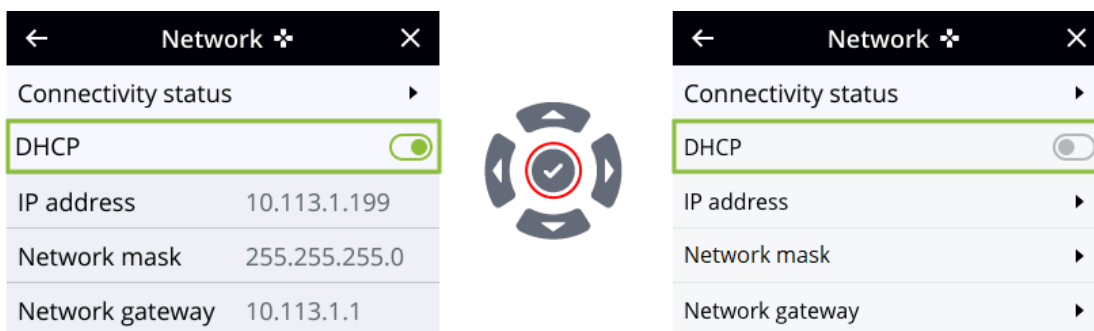
Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

If you don't see the front screen menu displayed on the front screen, press the **left arrow** key (or the right arrow key) on the control key interface to cycle through the different views. Pressing the left arrow key is mentioned throughout the user guide, but you could use either key to navigate.

Pressing the **check mark** key selects a highlighted option. In this example, pressing the **check mark** key while **Channel** is highlighted on the Menu screen opens the Channel screen. The small arrow head at the end of a row indicates more options.



The check mark key also toggles a switch on and off.



Darkened rows are not selectable and the fields are read only. In the example DHCP enabled screen, the IP address, Network mask, and Network gateway are all read only fields.

There are many functions you can perform using the front screen menu, like temporarily dimming the front screen and control keys when you select **System > Controls > Front screen**. Just press any key on the front panel of Pearl Nano to restore the screen and key luminance.

Record and stream using the control keys

Simply press the **Record control key** on Pearl Nano's front panel to easily start and stop recording a channel. The Record control key glows solid red and the recording timer on the Channel view increments while recording is in progress. When you're done, press the Record control key again to stop recording.

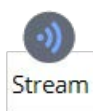


A formatted SD card (or SATA M.2 2280 SSD) must be installed and formatted before you can record video, see [SD card and SATA M.2 2280 SSD storage](#). If no record medium is available, dashes display in place of the recording timer and the Record control key does not function.



You cannot start recording using the Record control key while you are navigating the front screen menu system. Exit the front screen menu and then start recording using the Record control key.

To start and stop streaming, simply press the **Stream control key** on Pearl Nano's front panel to easily start and stop streaming a channel. The Stream control key glows solid blue and the streaming timer on the Channel view increments while streaming is in progress. When you're done, press the Stream control key again to stop streaming. If multiple streams are configured for the channel, pressing the Stream control key starts and stops all streams at the same time.



A stream must already be configured for the channel. If no stream is configured, dashes display in place of the streaming timer and the Stream control key does not function. To configure a live stream, see [Streaming to a CDN, multicasting, and streaming to multiple destinations](#).



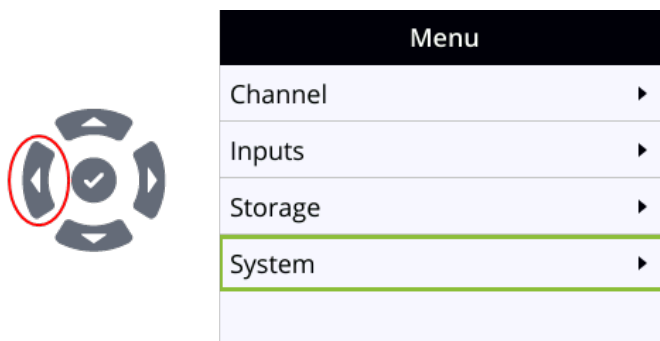
You cannot start streaming using the Stream control key while you are navigating the front screen menu system. Exit the front screen menu and then start streaming using the Stream control key.

Dim the front screen and control interface

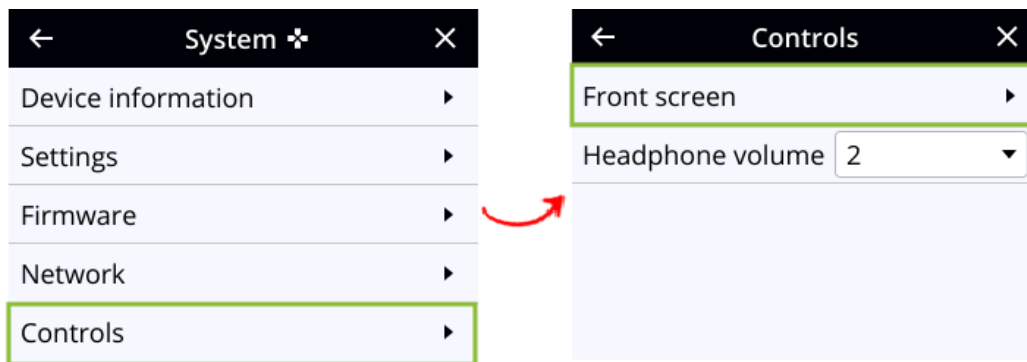
You can temporarily dim the front screen and control keys using the front screen menu. Just press any key on the front panel of Pearl Nano to restore the screen and key luminance. Alternatively, you could set an inactivity timeout and automatically dim the screen and control keys using the Admin panel, see [Set the front screen timeout](#).

Dim the front screen and control interface using the front screen menu

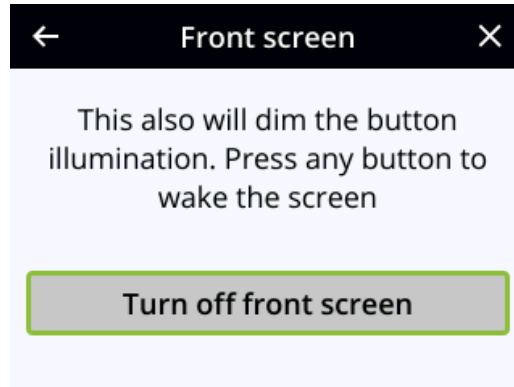
1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Controls** to open the Controls screen.



3. From the Controls screen, press the **check mark** key to select **Front screen**.



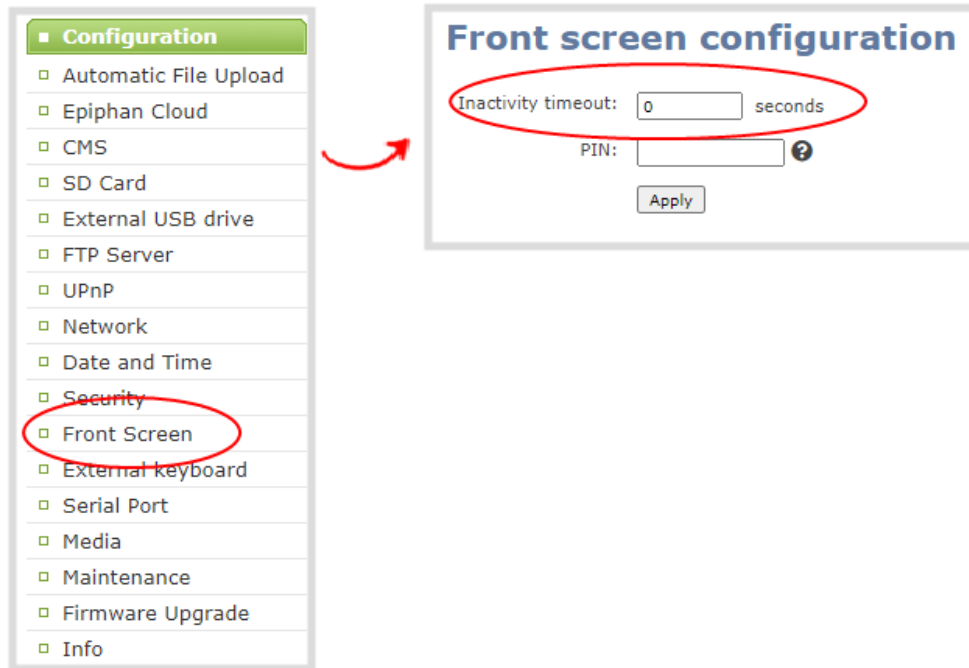
4. Press the **check mark** key to **Turn off front screen** or press the **left arrow** key to return to the previous screen without dimming the front screen and control key interface.

Set the front screen timeout

Initially, the front screen is always on for easy monitoring. However, you can set the front screen to shut off after a given amount of time. To re-enable the front screen after it times out and shuts off, simply press any key on the front panel of Pearl Nano.

Set the front screen timeout using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select . The front screen configuration page opens.



3. Enter the number of seconds before the front screen automatically shuts off in the **Timeout** field. A value of 0 keeps the front screen on at all times when the system is on.
4. Click **Apply**.

Set a PIN security code

You can set a 4 to 12 digit PIN code to protect the front screen of Pearl Nano from unauthorized access. By default, the PIN is not set.

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

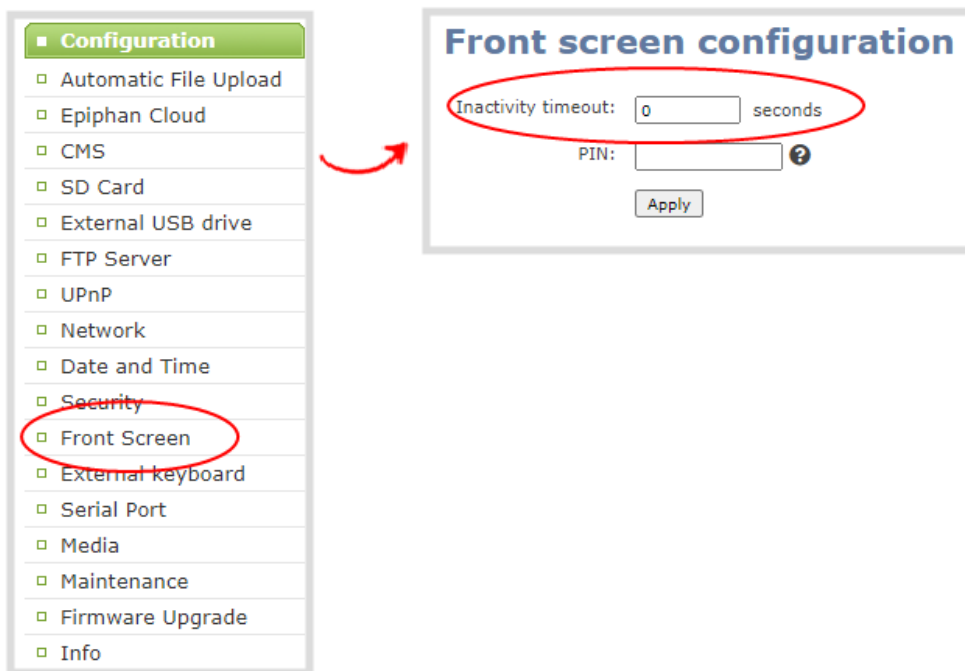
- You power on or restart Pearl Nano.
- Pearl Nano recovers from timeout mode, see [Set the front screen timeout](#).

Enter PIN to unlock device

1	2	3	4
5	6	7	8
9	0	.	✕

Set a front screen PIN security code using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Front screen**. The front screen configuration page opens.



3. Enter a 4 to 12-digit PIN code in the **PIN** field, then click **Apply**.



Record the PIN code in a safe location for future reference. You need this PIN to access the front screen of your Pearl Nano.

The Admin panel

The Admin panel is used primarily to set up your Pearl Nano 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 Admin panel](#)
- [Enable local console access to the Admin panel](#)
- [Connect using a DNS-based service discovery](#)
- [Connect using persistent static IP address](#)

For information about remote access to the cloud version of the Admin panel, see [Remote login to the Admin panel](#).

For information about integrating Pearl Nano with Content Management Systems (CMSs) like Panopto 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 Nano and perform administrative tasks.

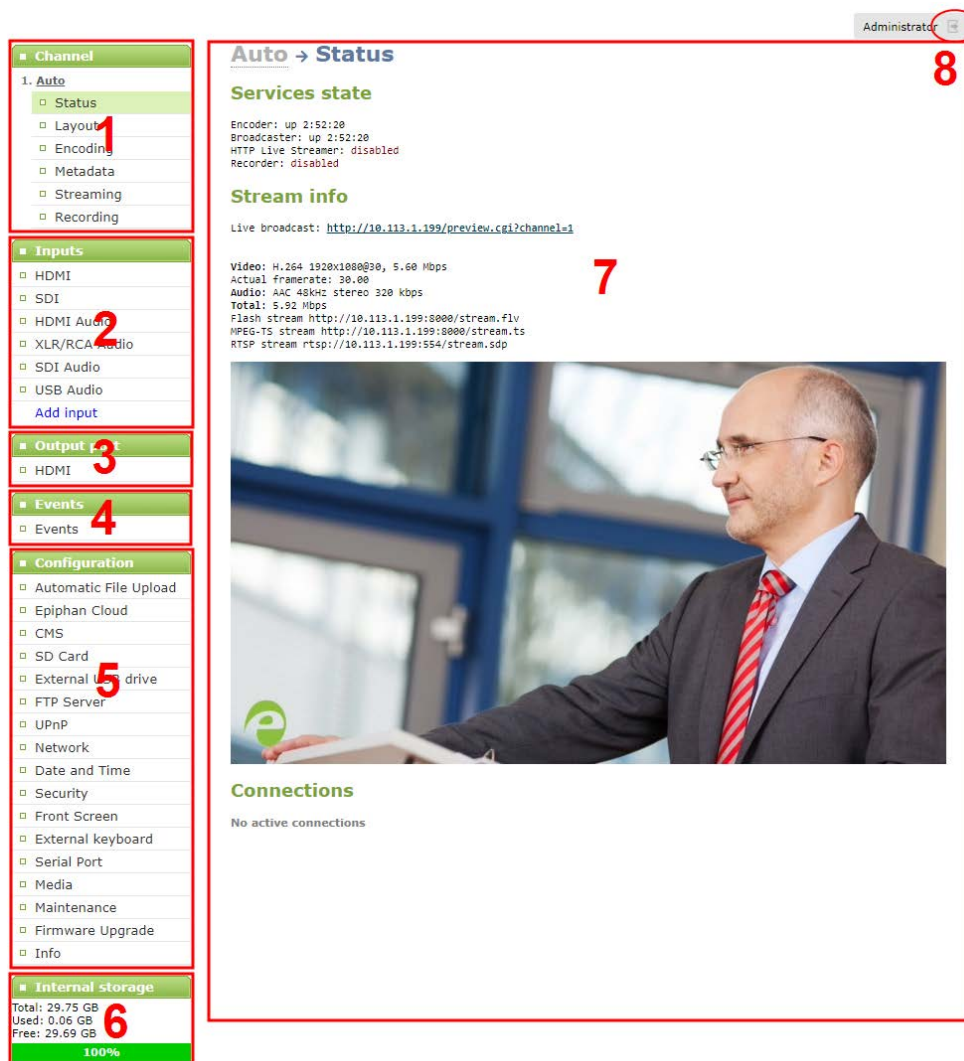


Table 10 The Admin panel

Label	Name	Description
1	Channel menu	Access the drop down list of options that are available to configure channel encoding, add video and audio sources, customize the layout, perform confidence monitoring, record the channel, and more.
2	Inputs menu	The available video and audio input ports on your Pearl Nano are listed. Select a port to open the configuration and status page for that port.
3	Output ports menu	The output ports available on your Pearl Nano are listed. Select a

Label	Name	Description
		port to open the configuration and status page for that port.
4	Events menu	Access the Content Management System (CMS) events list containing up to three months of scheduled Kaltura or Panopto events, in progress events, and completed ah hoc and scheduled events.
5	Configuration menu	A list of all the available configuration options.
6	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.
7	Main panel	The main panel is where the selected menu information displays. What's displayed depends on which menu item you select.
8	Log out	Click to log out of Pearl Nano. 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 Admin panel](#).
- Using a connected USB mouse, keyboard, and monitor, see [Enable local console access to the Admin panel](#).
- Remotely using Epiphan Cloud, see [Remote login to the Admin panel](#).

Connect to 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 Nano. All you need is the IP address of the system, which you can get from the settings using Pearl Nano's touch screen.

Another way to access the Admin panel is to remotely login over the Internet. An Epiphan Cloud Pro plan is required for remote login, see [Remote login to the Admin panel](#).

Get the IP address of Pearl Nano using the front screen menu and login to the Admin panel


1. To get the IP address of Pearl Nano, press the **left arrow** key repeatedly on the control key interface until the System status screen displays.

System status	
IP address	10.113.1.101
Firmware	4.14.0i
Uptime	07:22
CPU load	9%
SD card	111 GB of 111 GB
USB storage	Not detected


 You can also find the IP address of Pearl Nano from the front screen menu when you select **System > Network**.

- When you have the IP address of Pearl Nano, enter the following into the address bar of your web browser to launch the Admin panel.

```
http://<IP Address of Pearl Nano>/admin
```

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

- Enter your user name and password when prompted. The administrative user name is **admin**. Initially, no password is set so you can leave that blank and click **OK**.

 We recommend setting an admin password for higher security, see **User administration**.

If you don't know the IP address, you can do one of the following:

- 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 Pearl Nano without needing a laptop. With the local console feature, you can connect a USB mouse, keyboard, and a monitor directly to Pearl Nano. Or you can connect a touch screen monitor. Pearl Nano also supports connection of a USB wireless RF receiver or USB hub for local console.

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 front screen menu on Pearl Nano 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

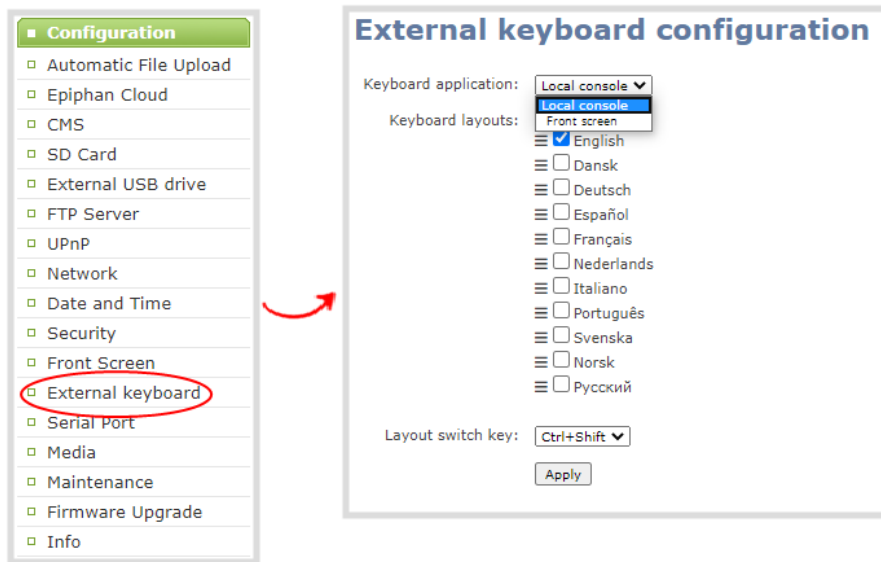
- The live preview link is not accessible from the Channel Status page using the local console.
- You cannot upload/download the following types of media using the local console:
 - Images
 - Channel recordings
 - EDID files
 - Configuration files
 - Firmware update files



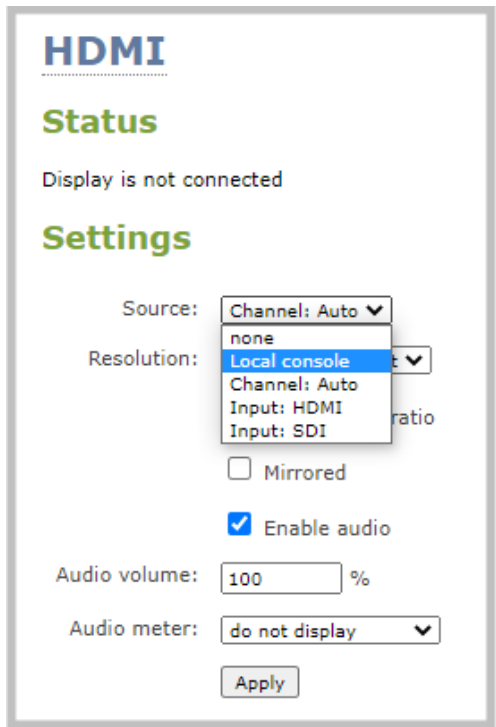
Use the web-based Admin panel from your administration computer for full access to all Admin panel functions.

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**). 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 login before using the local console to access the Admin panel on Pearl Nano.
- 9. Under Settings, select **Local console** in the Source drop-down menu.
- 10. Click **Apply**.

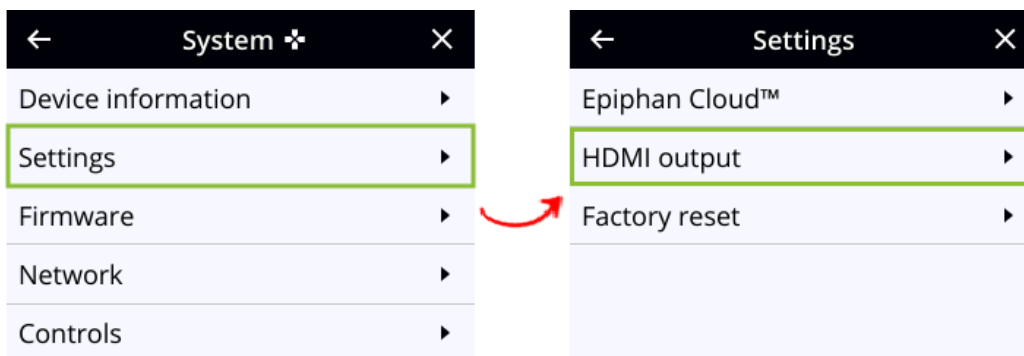
Enable local console using the front screen menu

- 1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.

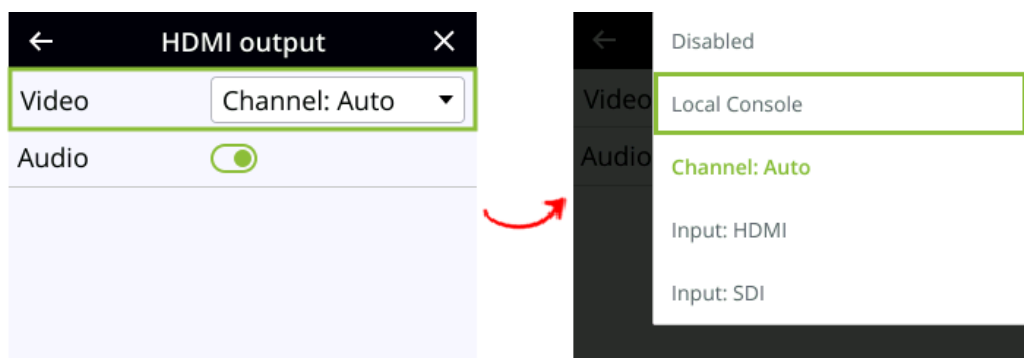


Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

- 2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Settings** to open the Settings screen.



- 3. From the Settings screen, select **HDMI output** to open the HDMI output screen, then press the **check mark** key to select Video and display the available video sources.



- 4. Highlight the video source you want, then press the **check mark** key to select and return to the previous screen. To return to the previous screen without making a selection, press the **left arrow** key.

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 Pearl Nano.

Connect using a DNS-based service discovery

Pearl Nano uses 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 11 Install Bonjour Print Services

System	Action Needed
Microsoft Windows	<p>You must install Bonjour Print Services:</p> <ol style="list-style-type: none"> 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.
Mac OS X	<p>The Bonjour software used for service discovery is built into the Mac OS. No special actions are needed.</p>
Linux	<p>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.</p>

Access the Admin panel of Pearl Nano using DNS discovery


1. Find the system’s serial number that’s printed on a label attached to the device.

TIP: The serial number also appears on the Device information screen from the front screen menu. Use the arrow keys and check mark to navigate the front screen menu and select **System > Device information**.

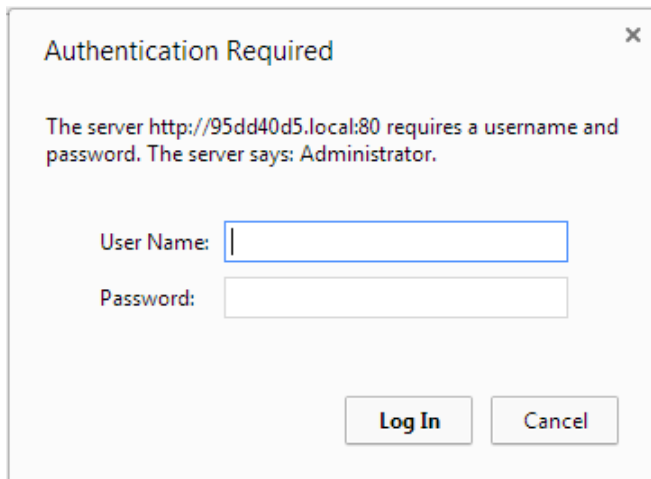
2. Enter the following string into the address bar of your web browser on your admin computer, where *<serial>* is the serial number of your Pearl Nano:

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

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

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

3. Enter your user name and password when prompted, then click **OK**. The administrative user name is **admin**. Initially no password is set. To set a password, see [User administration](#).



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

Pearl Nano has a default persistent static IP address, also known as the **recovery IP address**. If ever you need to set up Pearl Nano on a network that does not support DHCP, or you need to recover from a previous static IP address setting, you can use this procedure to connect directly to the system for configuration.

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

Pearl Nano 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 Nano and the workstation using one of the following methods:
 - a. Connect Pearl Nano to a local Ethernet network shared with the workstation.
 - b. Connect Pearl Nano 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 Pearl Nano 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 Pearl Nano, replace *http* with *https* in the URL.

5. Log in as the administrator user with the user name **admin** and enter the admin password (by default there is no password assigned). The Admin panel opens.
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 Pearl Nano. For more information, see [Configure network settings](#).
8. Restore the previously saved network configurations on the workstation.

Cloud-based device management

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

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

Topics include:

- [About device management with Epiphan Cloud](#)
- [Enable or disable Epiphan Cloud access](#)
- [Pair and unpair from Epiphan Cloud](#)
- [Remote login to the Admin panel](#)

For more information about Epiphan Cloud, see the [Epiphan Cloud User Guide](#).

About device management with Epiphan Cloud

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

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

Using Epiphan Cloud 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 login to cloud versions of the Admin panel for remote rescue troubleshooting, full administration access, and to control recording and streaming using the Admin panel.

For more information about Epiphan Cloud features and functions, see the online [Epiphan Cloud User Guide](#).

Important considerations

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

Enable or disable Epiphan Cloud access

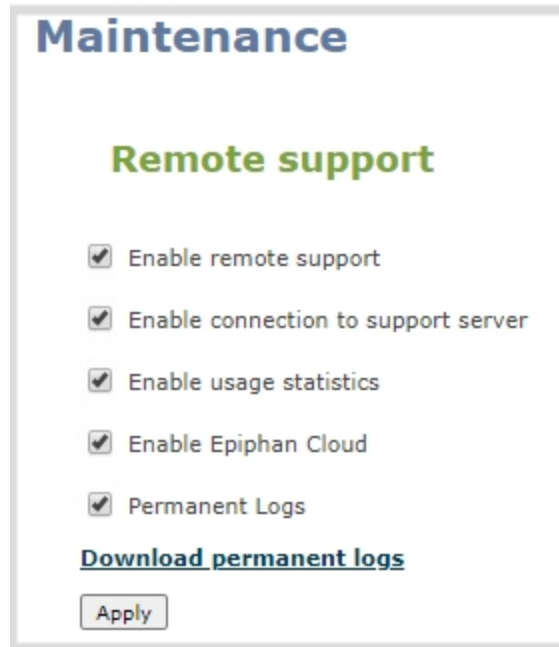
Epiphan Cloud is where you go to remotely manage and control all your Pearl Nano devices. Access is enabled on Pearl Nano by default. All you need to do is pair Pearl Nano to your free Epiphan Cloud account for access to your device over the Internet. You can disable Epiphan Cloud access on Pearl Nano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

Important considerations

- Unpair Pearl Nano from Epiphan Cloud before disabling Epiphan Cloud access on Pearl Nano using the Admin panel.
- If you disable Epiphan Cloud access while Pearl Nano is paired, the device instance in Epiphan Cloud goes permanently offline. For more information, see [Pair and unpair from Epiphan Cloud](#).

Enable or disable Epiphan Cloud access using the Admin panel

1. Login as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance**. The Maintenance page opens.
3. Uncheck **Enable Epiphan Cloud** to disable the feature or leave it checked to allow Pearl Nano to access Epiphan Cloud. Click **Apply** to save your changes.



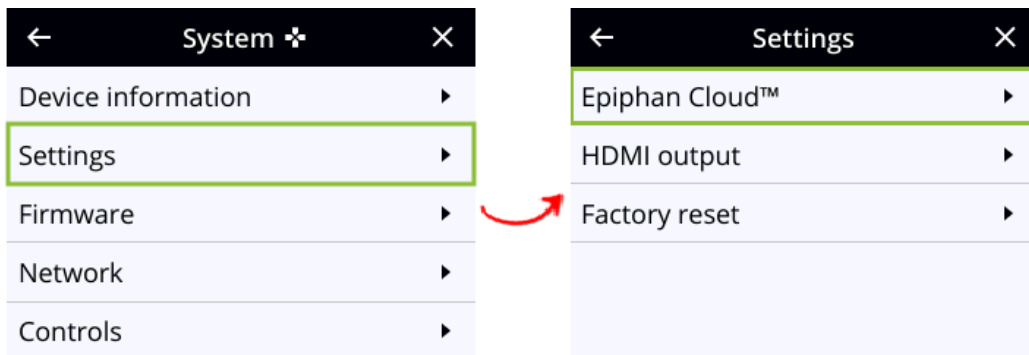
Enable or disable Epiphan Cloud access using the front screen menu

1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.

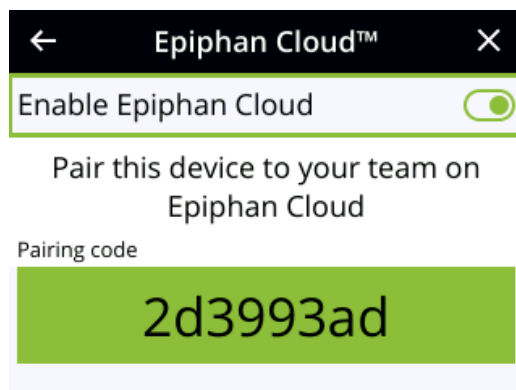


Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Settings** to open the Settings screen.



3. From the Settings screen, select **Epiphan Cloud** to open the Epiphan Cloud screen.



4. Highlight **Enable Epiphan Cloud** and press the **check mark** key to toggle the switch on or off.

Pair and unpair from Epiphan Cloud

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

Easily pair Pearl Nano directly from the Admin panel or add Pearl Nano as a new device in Epiphan Cloud using Pearl Nano's device ID pairing code. To manually pair Pearl Nano in Epiphan Cloud using Pearl Nano's pairing code, see the [Epiphan Cloud online user guide](#).



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

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



If you unpair from Epiphan Cloud using Pearl Nano's front screen menu or the Admin panel, Pearl Nano's status in Epiphan Cloud only changes to the offline state. To completely unpair Pearl Nano from Epiphan Cloud, you must use Epiphan Cloud to unpair your Pearl device.

Important considerations

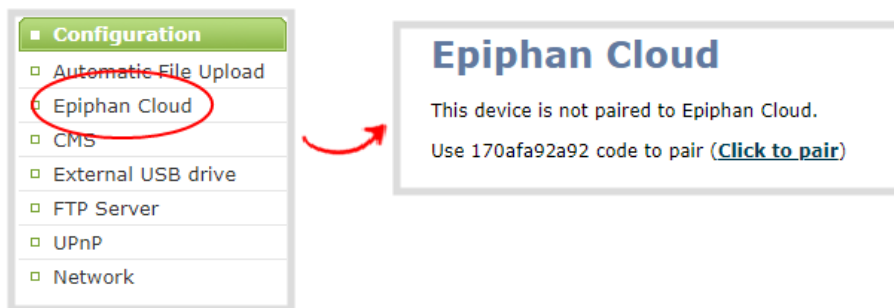
- Pearl Nano's device entry in Epiphan Cloud permanently goes offline when you unpair. You must pair Pearl Nano again to use Epiphan Cloud to remotely manage or login to Pearl Nano.
- If you pair Pearl Nano again after you have successfully unpaired from Epiphan Cloud, a new device instance is created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



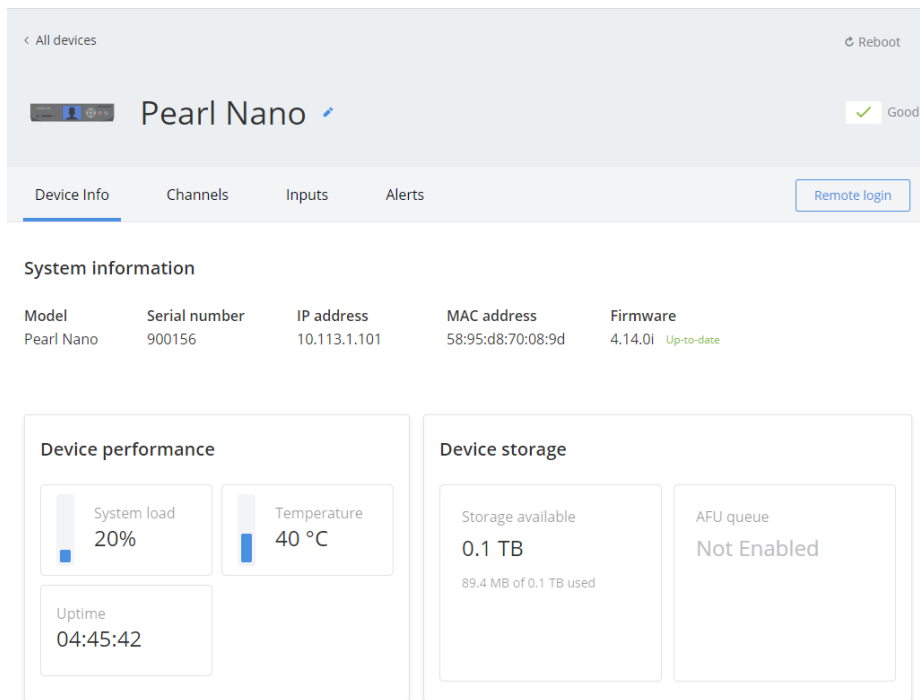
You can still access information about permanently offline device instances in Epiphan Cloud.

Pair and unpair Pearl Nano using the Admin panel

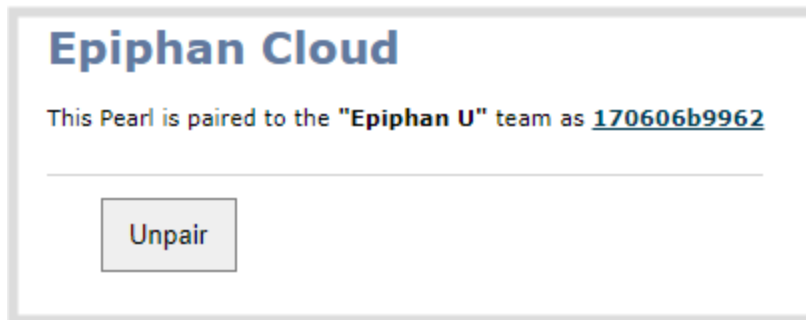
1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Epiphan Cloud**. The Epiphan Cloud status page opens. The pairing code device ID for Pearl Nano is shown, as well as a link to pair the device.



3. Select **Click to pair**. The Epiphan Cloud login page opens in a new tab (<https://go.epiphan.cloud>)
4. Login to your existing Epiphan Cloud account or sign up for a free account.
5. After you've logged in to Epiphan Cloud, your Pearl Nano automatically pairs to your default Epiphan Cloud team and the Device Details page opens in Epiphan Cloud. If you have multiple teams associated with your account, you're prompted to select a team.



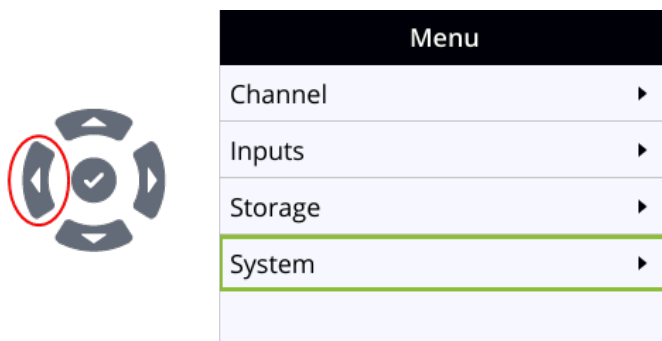
6. In the Admin panel, the status of Pearl Nano updates to **paired** on the Epiphan Cloud status page.



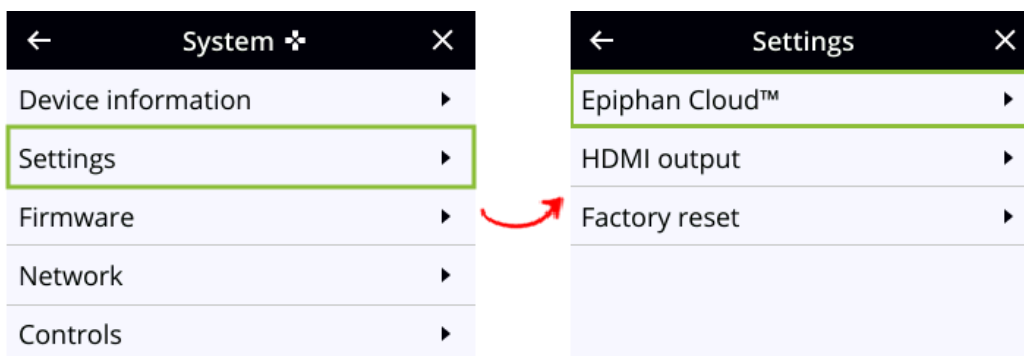
7. To unpair Pearl Nano using the Admin panel, select **Unpair** on the Epiphan Cloud status page.

Get the pairing code or unpair Pearl Nano using the front screen menu

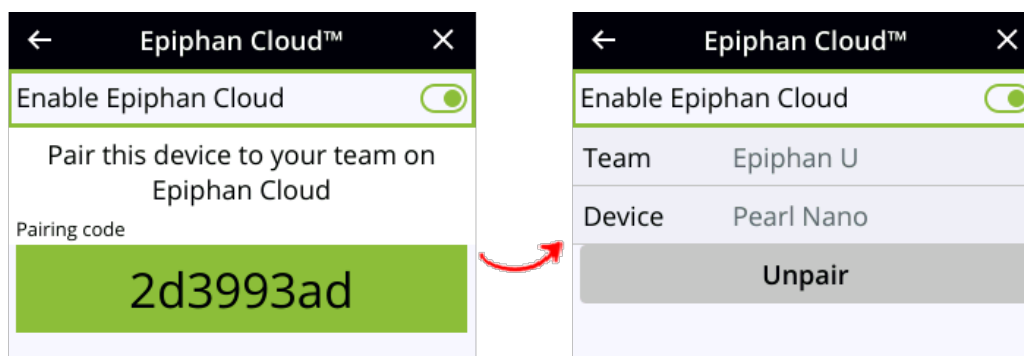
1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Settings** to open the Settings screen.



3. From the Settings screen, select **Epiphan Cloud** to open the Epiphan Cloud screen.
 - a. If Pearl Nano is not currently paired to Epiphan Cloud, the pairing code displays on screen.
 - b. If Pearl Nano is paired to Epiphan Cloud, the screen changes and displays the option to **Unpair** instead of the pairing code.



Remote login to the Admin panel

You can remotely login to Pearl Nano for full administration access to configure and operate Pearl Nano over the Internet using a cloud version of the Admin panel. You just need to pair Pearl Nano to an Epiphan Cloud account that has one of the Pro plans.

With an Epiphan Cloud Pro plan, full administrative access to your Pearl Nano 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.



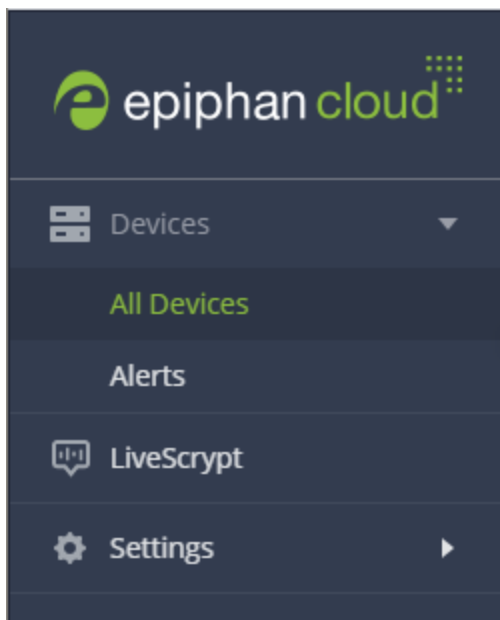
The URL of the local web version of the Admin panel are not the same as the URL of the cloud version. An Epiphan Cloud Pro plan is only required to access the cloud version.

Before you begin

- Make sure Pearl Nano is paired to your Epiphan Cloud account, see [Pair and unpair from Epiphan Cloud](#).
- Upgrade to one of the Epiphan Cloud Pro plans.

Access the cloud version of the Admin panel

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

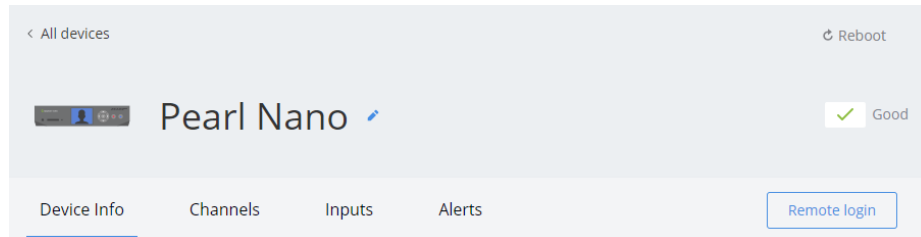


3. Click the device name in the list to open the details page for that device.



From the All Devices page, you can also click the three dots at the far right in the device's row and select **Remote login**.

4. From the Device Details page, click **Remote login** in the header bar. A new tab with the cloud Admin panel login opens in your browser.



See [The Admin panel](#) for instructions to use the interface or to access the local web version.

PART 1: Setup

This section contains tasks that are needed to get your Pearl Nano configured to connect to your local network, make system settings, add passwords, make backups of your configuration, and covers how to access status information and monitor the performance of your Pearl Nano.

Topics include:

- [Configure network settings](#)
- [Configure network security](#)
- [Configure date and time](#)
- [Configure device info, name, description, and location](#)
- [Video output ports](#)
- [Connect an external keyboard](#)
- [Connect a USB status light](#)
- [Configuration presets](#)
- [User administration](#)
- [Status and monitoring](#)

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

Configure network settings

Pearl Nano uses 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 Nano](#)
- [Verify IP address and MAC address of Pearl Nano](#)
- [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 Nano

The following table lists the default incoming and outgoing network ports that Pearl Nano uses.

Do not block traffic over these ports. If you want Pearl Nano 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 12 Default incoming network ports for Pearl Nano

Port (or range)	Protocol	Description
21	TCP	FTP server, if enabled. See Local FTP server .
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 .

Port (or range)	Protocol	Description
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 .
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 is also used for internal communications. If streaming is disabled, the port remains 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.
1900	UDP	UPnP server for UPnP discovery, if enabled. See Stream using UPnP .
Random in range 50000 to 65000	TCP	UPnP media server, if enabled. Each time the UPnP server is started, a random TCP port in this range is used to enable connections with other UPnP devices.
5353	UDP	For multicast DNS discovery. See Connect using a DNS-based service discovery .
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 is also used for internal communications. If streaming is disabled for the channel from Channel > Streaming using the Admin panel, the port remains open but refuse all external connection requests.

In addition to the incoming ports, Pearl Nano uses 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 [FTP and automatic file transfers](#).

Verify IP address and MAC address of Pearl Nano

There are two ways to view the current IP address and MAC address of Pearl Nano:

- From the Network configuration page using the Admin panel.
- From the front screen menu when you select **System > Network**.

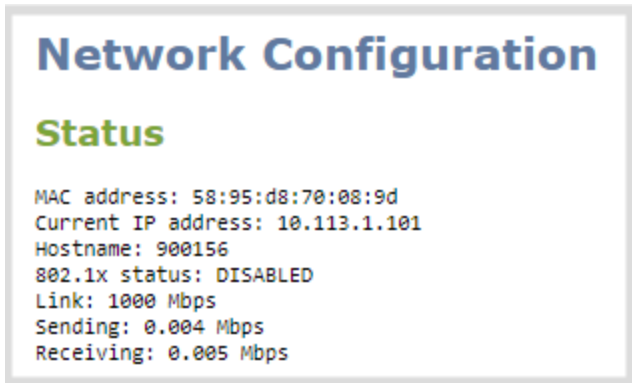
You can also see the IP address when you navigate to the System status screen using the front panel control interface.

Table 13 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 Nano supports IPv4 addresses. It does not support IPv6 addresses.

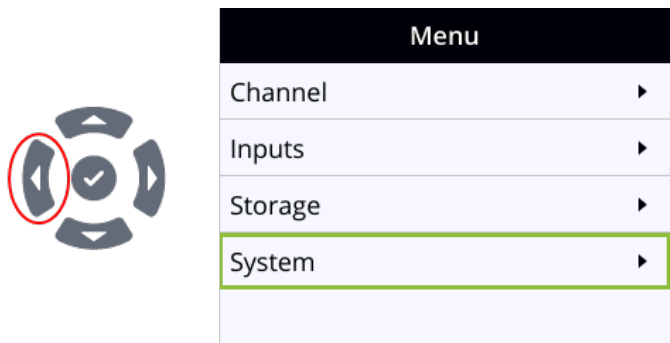
View network information using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Network**. The network configuration page opens.

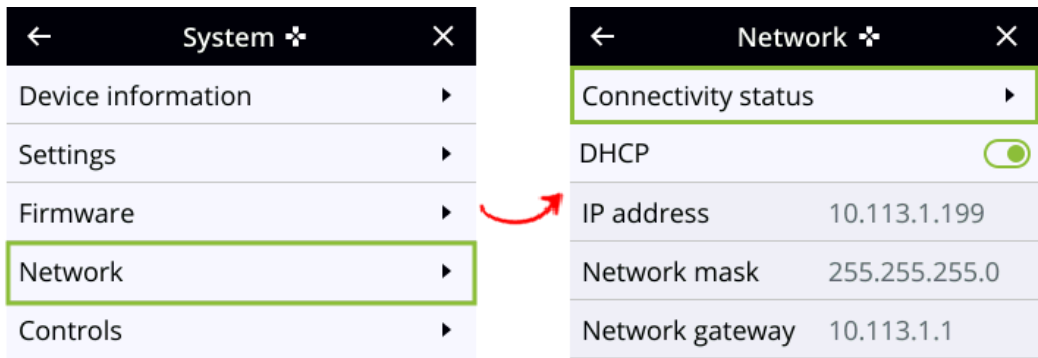


View network information using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Network** to open the Network screen.



3. From the Network screen, use the arrow keys to scroll down the list to see all the network parameters, like the MAC address.

Configure a static IP address

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

- From the Network configuration page using the Admin panel.
- From the front screen menu when you select **System > Network**.

You can also see the IP address when you navigate to the System status screen using the front panel control interface.

TIP: Using the front screen menu, you can choose to apply a configuration preset that contains a static network IP. See [Configuration presets](#).

Only IPv4 addresses are supported. Pearl Nano does not support IPv6.

Configure a static IP address using the Admin panel

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

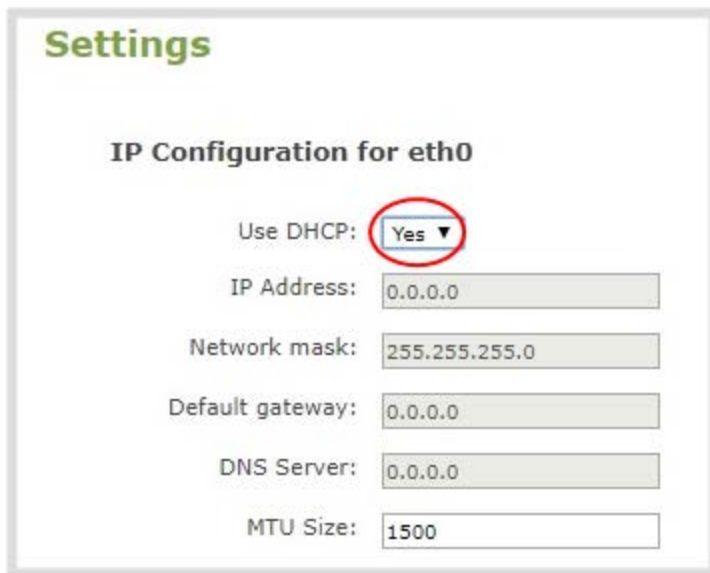


Table 14 Static IP Address Fields

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 Nano supports IPv4 addresses. It does 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 DHCP. 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.

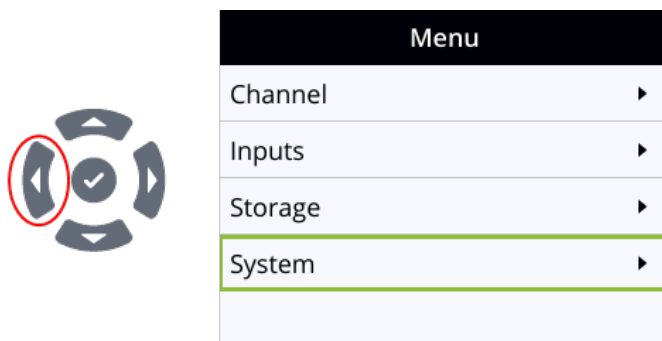


The default gateway and DNS Server fields cannot be left blank. If you do not have a default gateway or a DNS server for your network, enter the static IP address in those fields.

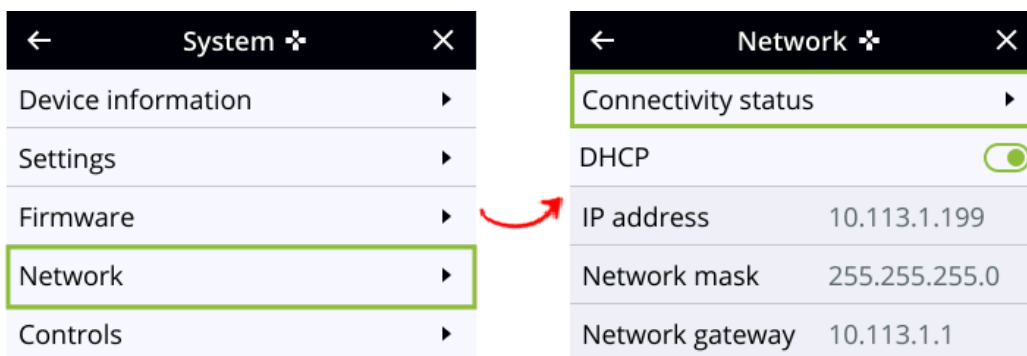
4. Reboot Pearl Nano when prompted. From the Configuration menu, select **Maintenance** and click **Reboot Now** on the Maintenance page.
5. After the system has finished rebooting, use the new IP address to log back in to the Admin panel as **admin** and verify that all changes were applied.

Configure a static IP address using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Network** to open the Network screen.

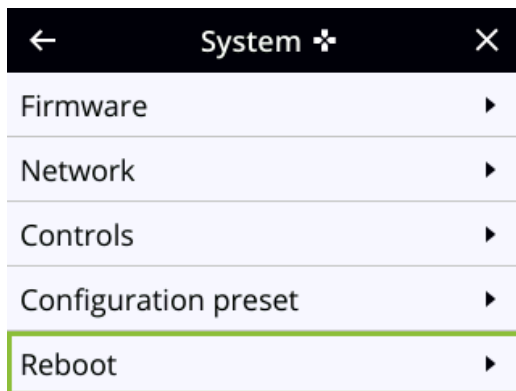


3. From the Network screen, use the arrow keys to highlight **DHCP** and press the **check mark** key to toggle the switch off. The network addresses disappear from the screen.
4. Use the arrow and check mark keys to select **IP address**. The screen to enter a static IP address opens.



5. Use the arrow and check mark keys to enter a static IP address, then select **Set IP address**. If you leave the IP address screen without setting the IP address, the IP address you entered is not assigned to Pearl Nano.

6. Reboot Pearl Nano to apply the network changes. Return to the System screen and use the down arrow key to scroll down until Reboot appears. Then select **Reboot** using the **check mark** key and select **Reboot now** when prompted.



Configure DHCP

If you need to switch Pearl Nano 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. See [Apply a configuration preset using the Admin panel](#) or [Apply a configuration preset using the front screen menu](#).
- Change the network settings manually using either the front screen menu 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 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**.

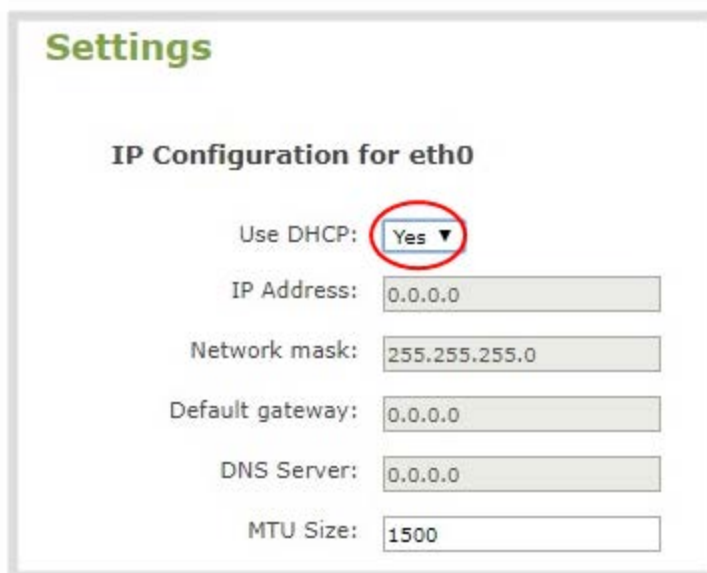


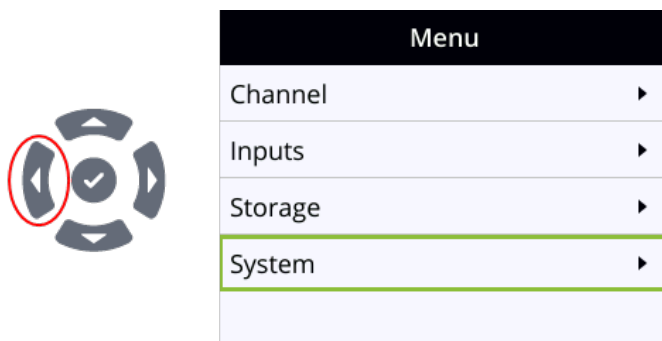
Table 15 DHCP Fields

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.

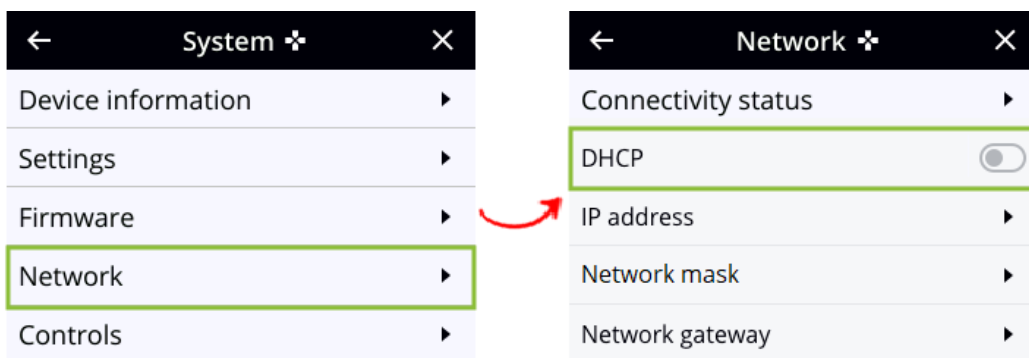
4. Reboot Pearl Nano when prompted. From the Configuration menu, select **Maintenance** and click **Reboot Now** on the maintenance page.
5. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

Manually select DHCP as the network type using the front screen menu

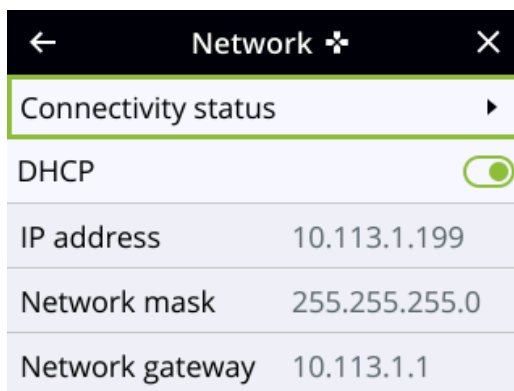
- 1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



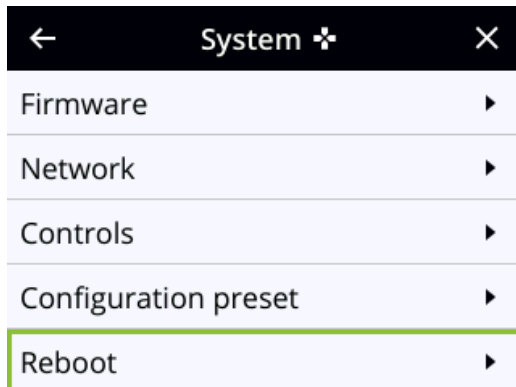
- 2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Network** to open the Network screen.



- 3. From the Network screen, use the arrow keys to highlight **DHCP** and press the **check mark** key to toggle the switch on. The DHCP acquired network addresses appear on the screen.



- 4. Reboot Pearl Nano to apply the network changes. Return to the System screen and use the down arrow key to scroll down until Reboot appears. Then select **Reboot** using the **check mark** key and select **Reboot now** when prompted.



Configure DHCP Option 81

Ensure your Domain Name Server (DNS) always has Pearl Nano's most up-to-date IP address mapped to Pearl Nano'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. Pearl Nano automatically asks the DHCP server to tell the Domain Name Server (DNS) to update Pearl Nano's record with any changes to Pearl Nano'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 Admin panel](#).
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Under Settings, check **Send FQDN (DHCP Option 81)**.

Settings

IP Configuration for eth0

Use DHCP:

IP Address:

Network mask:

Default gateway:

DNS Server:

MTU Size:

Send FQDN (DHCP option 81)

DNS FQDN:

4. In the **DNS FQDN** field, enter the FQDN of your Pearl Nano, for example: *mypearl.mydomain.com*
5. Click **Apply**.
6. Reboot Pearl Nano 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 Pearl Nano's IP address, Pearl Nano informs the DDNS to update it's domain name records. That way, you can keep using Pearl Nano'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 16 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

Label	Description/Options
	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 Pearl Nano updates the DDNS server with Pearl Nano'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 Nano in the DDNS server records. Pearl Nano'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 Pearl Nano 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 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.

Dynamic DNS

Enabled


Status: Stopped

Reported IP:

Report time:

Provider: Custom ▾

DDNS server name:

DDNS server path: 

Use SSL

Update period: seconds

Username:

Password:

Hostname:

External IP detection server name:

External IP detection server path:

Use SSL for external IP detection

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 Nano, for example: *mypearl*. The default hostname is the serial number of Pearl Nano.
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 Pearl Nano 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 Pearl Nano, the default HTTP port is 80 and the default HTTPS port is 443. If the default ports used by Pearl Nano 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 Pearl Nano, see **Network ports used by Pearl Nano**.

Change the HTTP/HTTPS port values using the Admin panel

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

HTTPS configuration

Secure connection (HTTPS)

HTTP port: (HTTP redirects to HTTPS port when HTTPS is enabled)

HTTPS port:

Current Certificate: Built-in self-signed certificate

Certificate info: Issuer: O=Epiphan Video, Subject: O=Epiphan Video, From: 08/09/2016 To: 08/07/2026, Valid

New certificate: No file chosen

Private Key: No file chosen



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

4. Reboot Pearl Nano 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 using the Admin panel. For quick troubleshooting, you can run the Connectivity status diagnostics using the front screen menu. You can also run network diagnostics from Epiphan Cloud, see the online [Epiphan Cloud User Guide](#).

For more information about the network diagnostic tools and test results, see [Diagnostic tools](#).

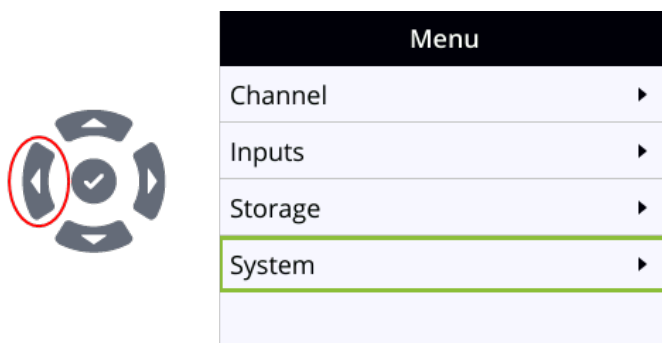
If you are unable to resolve your networking issues using the diagnostic tools, contact your network administrator and provide them with the IP address and MAC address of your Pearl Nano; otherwise, contact Epiphan Video support for assistance.

Perform network diagnostics using the Admin panel

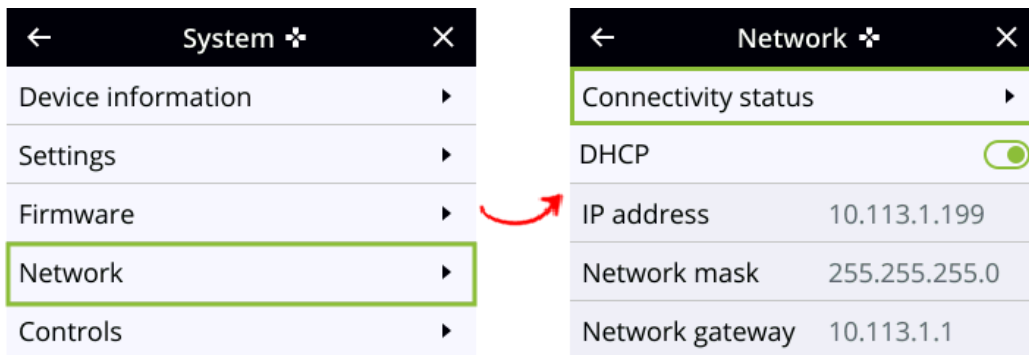
1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. In the Network diagnostics section, choose a diagnostic test from the drop-down menu and select **Start**.

Perform connectivity status diagnostics using the front screen menu

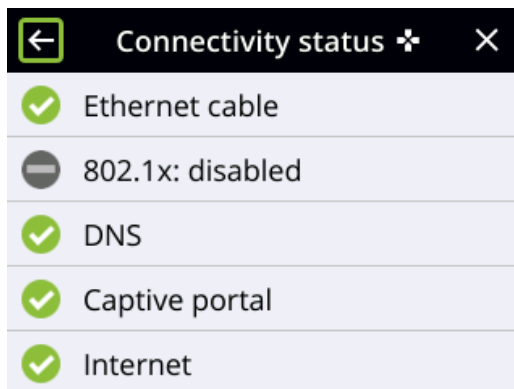
1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Network** to open the Network screen.



3. From the Network screen, press the **check mark** key to select Connectivity status and open the Connectivity status screen.
4. Use the arrow keys to scroll through the list of diagnostics results.



Disable the network discovery port

You can disable the network discovery port on Pearl Nano using the Admin panel so that services can no longer discover Pearl Nano systems using multicast DNS (mDNS). The network discovery port on Pearl Nano 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](#).

Disable the network discovery port using the Admin panel

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

Discovery

Make this device discoverable on the network as D569D035.local

Configure network security

Pearl Nano supports 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 Pearl Nano 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 Pearl Nano, see [Set or change user passwords](#).

Configure 802.1x network security and manage user certificates

You can enable 802.1x security and configure the EAP method for Pearl Nano 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 Pearl Nano 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 Pearl Nano 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 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.

IEEE 802.1x

Enabled

EAP method: PEAP ▼

Verify server's identity

Authentication method: EAP-MSCHAPv2 ▼

Username:

Password:

User certificate: Choose File No file chosen

User private key: Choose File No file chosen

Delete certificate

Apply


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 17 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 Pearl Nano 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**.

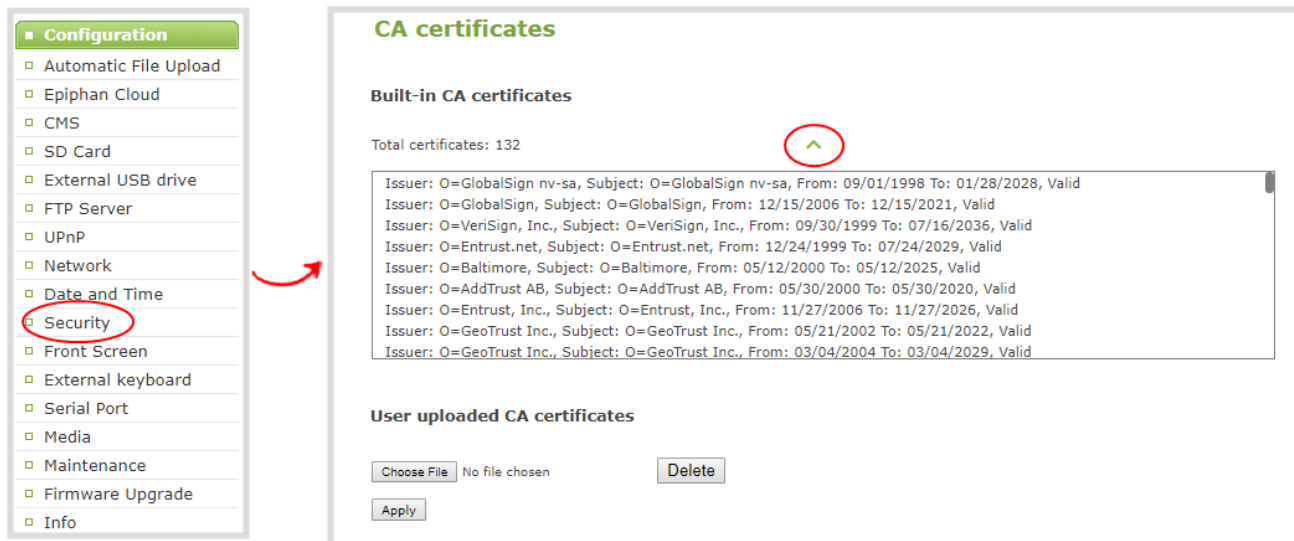
Manage CA and self-signed certificates

You can view the list of CA and self-signed certificates that come preloaded on Pearl Nano. 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](#).

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 Nano. Security certificates must be PEM encoded.

Manage CA and self-signed certificates on Pearl Nano using the Admin panel

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



The screenshot shows the Admin panel interface. On the left is a 'Configuration' sidebar with a list of menu items: Automatic File Upload, Epiphan Cloud, CMS, SD Card, External USB drive, FTP Server, UPnP, Network, Date and Time, Security (circled in red), Front Screen, External keyboard, Serial Port, Media, Maintenance, Firmware Upgrade, and Info. A red arrow points from the 'Security' menu item to the main content area. The main content area is titled 'CA certificates' and contains two sections: 'Built-in CA certificates' and 'User uploaded CA certificates'. The 'Built-in CA certificates' section shows 'Total certificates: 132' and a list of certificates with their issuer, subject, and validity dates. A red circle highlights an upward-pointing arrow icon next to the total count. The 'User uploaded CA certificates' section has a 'Choose File' button (with 'No file chosen' text), a 'Delete' button, and an 'Apply' button.

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 Pearl Nano 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 Nano 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.



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

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

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 Pearl Nano, a warning message appears stating that the device isn't trusted. You can choose whether to proceed and connect to Pearl Nano's web-based Admin panel without the security certificate authentication or cancel the connection.



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

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

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

HTTPS configuration

Secure connection (HTTPS)

HTTP port: (HTTP redirects to HTTPS port when HTTPS is enabled)

HTTPS port:

Current Certificate: Built-in self-signed certificate

Certificate info: Issuer: O=Epiphan Video, Subject: O=Epiphan Video, From: 08/09/2016 To: 08/07/2026, Valid

New certificate: No file chosen

Private Key: No file chosen

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 Pearl Nano when you try and connect to Pearl Nano using a web-browser, you'll receive a warning that the device isn't trusted.

6. Click **Apply** when you're done.
7. Reboot Pearl Nano 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 date and time

Pearl Nano 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 zone](#)

View the current date and time settings

You can view the current date and time settings of Pearl Nano using the Admin panel.

To manually set the date, time, and time zone using the Admin panel, see [Manually set the date, time, and zone](#).

To change the server used for synchronizing time, see [Configure a time server](#).

View the current Date and Time settings using the Admin panel

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

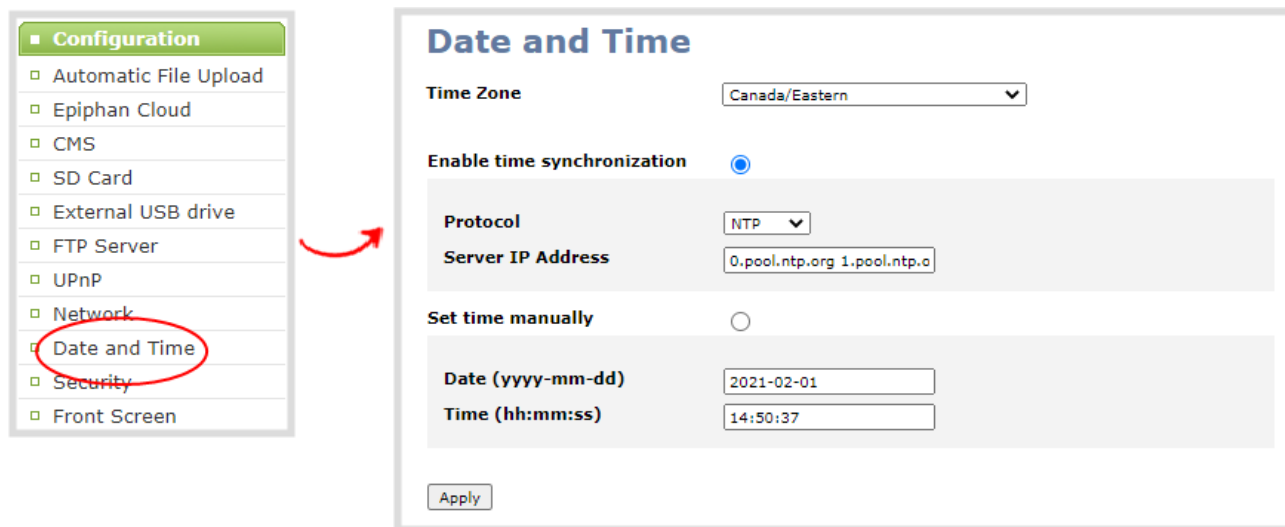


Table 18 Date and Time configuration options

Label	Description/Options
Time Zone	The currently selected time zone.
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.
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.


Configure a time server

Pearl Nano 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 Nano supports.

Table 19 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. 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 Nano. For more information about NTP and to find NTP servers, refer to http://support.ntp.org/bin/view/Servers/WebHome .
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 Nano and PTP sends UDP packets over ports 319 and 320. If Pearl Nano is behind a firewall, you must open these ports to allow traffic when Pearl Nano 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 Admin panel](#).
2. From the Configuration menu, click **Date and Time** . The Date and Time configuration page opens.
3. 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 20 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

4. Click **Apply**.

Manually set the date, time, and zone

Pearl Nano uses NTP for time synchronization by default. However, you can manually set the date and time for Pearl Nano using the Admin panel. You can also set the time zone. Pearl Nano uses the Eastern (Canada) time zone by default.

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

1. Login to the Admin panel as **admin**, see [Connect to 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 *yyy-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 Pearl Nano a unique device name using the Admin panel and add information such as a description and location. Alphanumeric characters and hyphens are supported. The serial number of Pearl Nano 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 Pearl Nano is used for the folder name instead of Pearl's serial number.

For Kaltura and Panopto, the device name you set here for Pearl Nano 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 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. alphanumeric characters and hyphens.

Format the SD card

Before you can use your SD card for recording video using Pearl Nano, you must format the SD card for the Ubuntu operating system. We recommend using a minimum class 10 SD card that is EXT4 formatted. The SD card should have at least 64 GB capacity and should not exceed 512 GB.

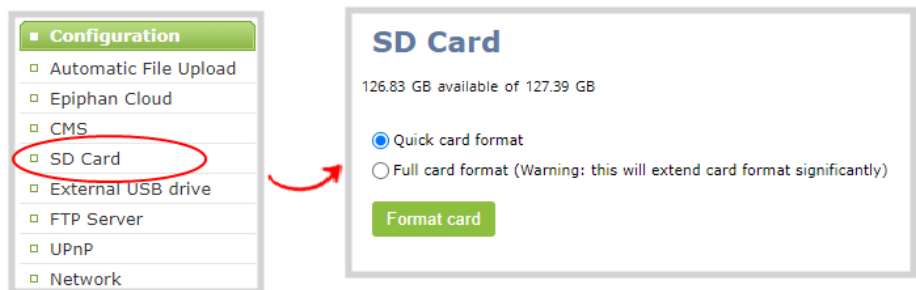
After an SD card is formatted using Pearl Nano, do not manually change the default file folder structure on the SD card.



Any content that's contained on the SD card is lost when the SD card is formatted. The Ubuntu formatted SD card cannot be used to transfer files to iOS or Windows systems. Use a USB memory device to manually transfer files instead.


Format the SD card using the Admin panel

1. Insert the SD card into the SD card slot on the front panel.
2. Login to the Admin panel as admin, see [Connect to the Admin panel](#).
3. From the Configuration menu, select **SD Card**. The SD Card configuration page opens.



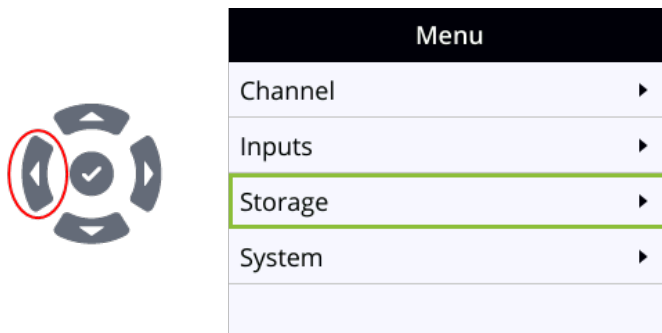
4. Select either quick disk format or the full disk format, then click **Format card**. A full disk format checks for bad blocks on the SD card and marks any that are found on the EXT4 partition.

You must wait for the formatting to finish before removing or recording to the SD card. The amount of time it takes to format depends on the capacity of the SD card and if you select quick disk format or the full disk format.

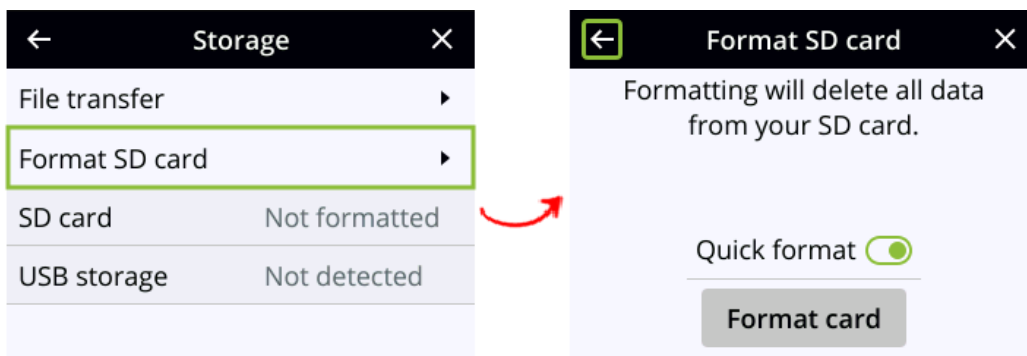
 Do not remove the SD card while it is being formatted. Very large SD cards can take a while to format. Please be patient and wait for the formatting message to disappear.

Format the SD card using the front screen

1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **Storage**. Then from the Storage screen, select **Format SD card** to open the Format SD card screen.




3. (Optional) Highlight **Quick format** and press the **check mark** key to toggle the switch on or off.
4. Highlight **Format card** and press the **check mark** key to start the process. The formatting in progress screen appears and the LED beside the SD slot starts flashing.
5. When the screen indicates formatting is complete and the LED is solid off, press the **check mark** key to return to the previous screen.

Install and format a SATA M.2 2280 SSD

You can install a user-supplied SATA M.2 2280 SSD for storing recorded video. Pearl Nano automatically formats the SSD using the EXT4 format for the Ubuntu operating system the first time you power on. So

please be patient while the formatting completes.

When you install a SATA M.2 SSD, Pearl Nano no longer detects the SD card slot and the SD card option is removed from the Admin panel's Configuration menu. For more information about using different storage mediums and recommendations, see [SD card and SATA M.2 2280 SSD storage](#).

 Any existing content on the SSD is lost when the SSD is formatted.


Before you begin

Gather the tools you need:

- #1 Phillips screwdriver
- #0 Phillips jeweler's screwdriver
- (Optional) a pair of tweezers

Install and format the SATA M.2 2280 SSD

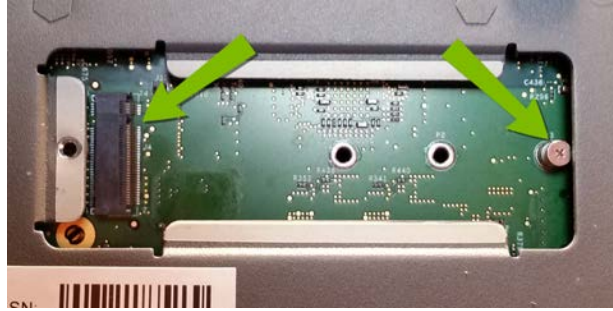
1. Disconnect the power cable and ensure Pearl Nano is powered off. If Pearl Nano uses PoE+ power from the connected RJ-45 Ethernet cable, ensure you disconnect the Ethernet cable from Pearl Nano.

 Permanent damage to the SSD and/or Pearl Nano can occur if you install, remove, or replace the SSD while Pearl Nano is powered on.

2. On a clean and level surface, turn Pearl Nano over to expose the bottom panel.
3. Use a #1 Phillips screwdriver to remove the SSD expansion slot cover plate. Set aside to for later.



4. Use a #0 Phillips screwdriver to remove the screw that's in the post farthest away from the M.2 socket. Set aside for later.



5. Hold the SSD by the edges and insert firmly into the M.2 socket at approximately a 30° angle. Make sure you align the key notch in the SSD with the notch in the M.2 socket.
6. Use one hand to gently press and hold the SSD down so that it rests atop the post. Align the notch on the SSD with the post hole.
7. With your other hand, use the #0 Phillips screwdriver to reinstall the post screw and secure the SSD in place.

TIP: Use the tweezers to pick up the screw if it falls behind the SSD.

8. Reinstall the SSD slot cover plate and power up Pearl Nano.

The SSD is formatted automatically the first time you power on. Please be patient while formatting completes. The amount of time it takes to format depends on the capacity of the SSD. You must wait for the formatting to finish before recording video to the SSD.



Powering off Pearl Nano while the SSD is formatting could damage or corrupt the SSD.

Audio input ports

You can connect external audio devices like audio mixers directly to the dedicated audio input ports on Pearl Nano. There are:

- Two 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)
- One USB (UAC) audio port

The XLR audio inputs are configured as a stereo pair by default: XLR1 (left) and XLR 2 (right). The XLR audio ports and the RCA audio ports are linked. You can configure Pearl Nano to use both or just one of the audio sources from the front screen menu or using the Admin panel.

Topics include:

- [Configure audio ports for stereo or mono](#)
- [Assign audio sources to an input](#)
- [Adjust audio gain and delay](#)
- [Mute audio](#)

For details about the audio inputs, see [AV inputs](#).

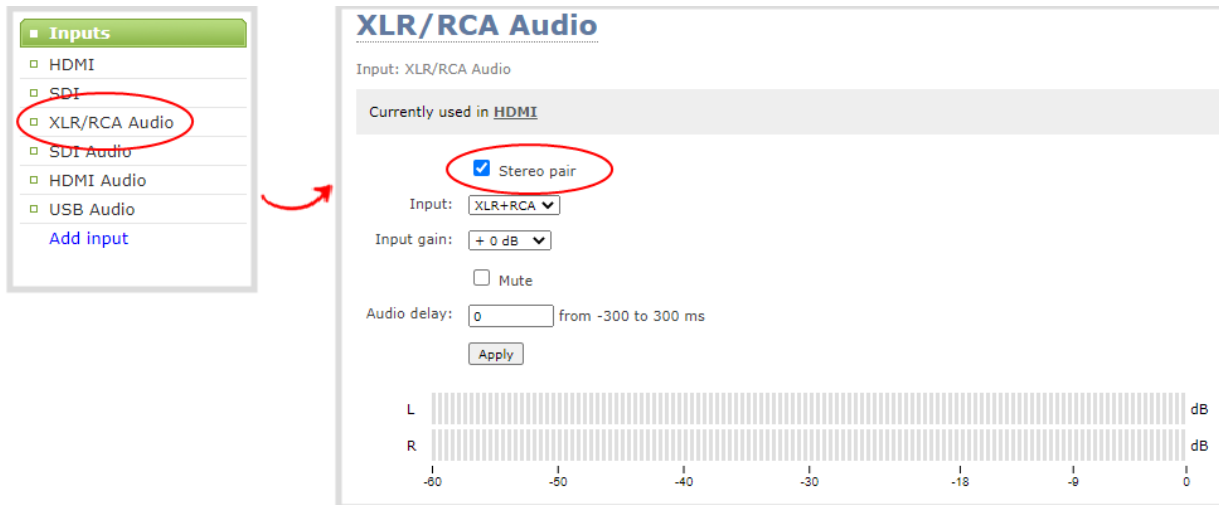
Configure audio ports for stereo or mono


The two XLR professional line-level inputs are configured as a stereo pair by default: XLR 1 (left) and XLR 2 (right).

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

Configure audio ports as stereo or mono using the Admin panel

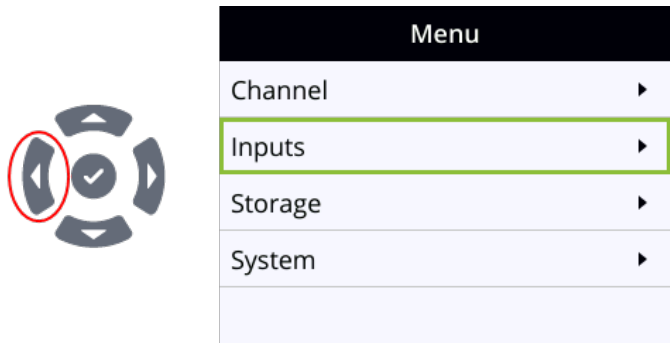
1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Inputs menu, click **XLR/RCA Audio**. The XLR/RCA Audio configuration page opens.
3. Do one of the following.
 - a. To make the ports function as a stereo pair, check **Stereo pair** and click **Apply**.
 - b. To make the ports function as separate mono ports, uncheck **Stereo pair** and click **Apply**.



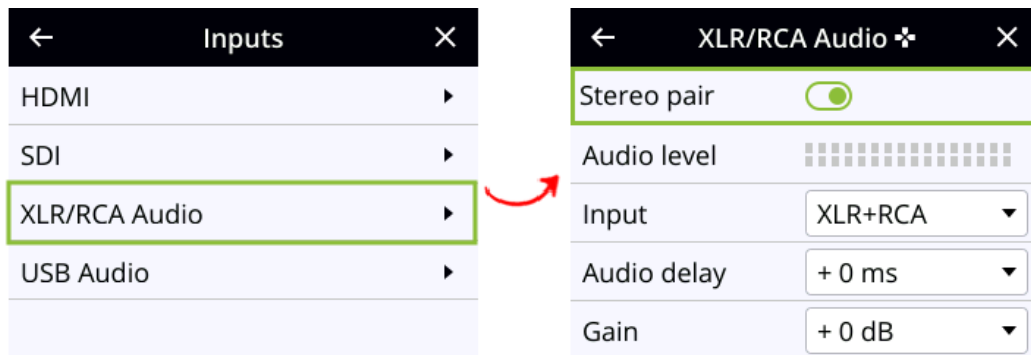
 When mono is selected, two sets of parameters and two audio VU meters appear in the interface - one for each audio input port on Pearl Nano. Parameters that are listed only once apply to both ports.

Configure audio ports as stereo or mono using the front screen

1. Repeatedly press the **left arrow** key on the control interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **Inputs**. Then from the Inputs screen, select **XLR/RCA Audio** to open the XLR/RCA Audio screen.



3. Highlight **Stereo pair** and press the **check mark** key to toggle the switch on or off.

Assign audio sources to an input

Some audio input ports share internal audio processing resources in Pearl Nano. 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:

- XLR 1 and XLR 2 (left and right ports, respectively)
- RCA (left and right ports)

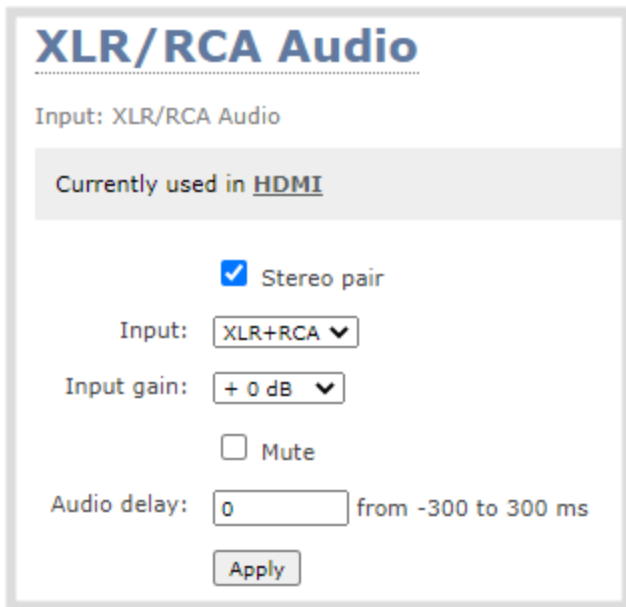
Both the XLR (left/right) and RCA (left/right) audio sources appear under the label **XLR/RCA Audio**. You can assign one or both audio sources to **XLR/RCA Audio**. Choosing one audio source for the shared input disables the other audio source. This means that when you select XLR/RCA Audio as the audio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



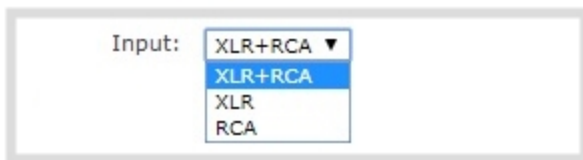
To avoid unwanted signal noise on the RCA ports, we recommend adding no more than 12dB of gain when RCA or XLR+RCA is selected.

Assign the audio source to an input using the Admin panel

1. Login to the Admin panel as **admin**. See [Connect to Admin panel](#).
2. From the Inputs menu, select the shared audio source. The audio configuration page opens.

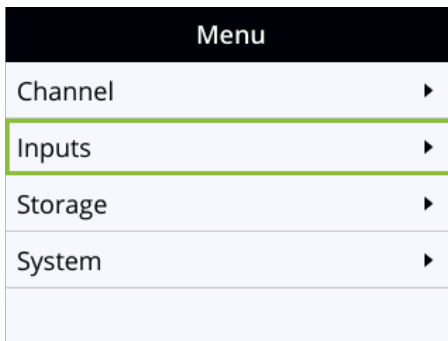


3. From the **Input** menu, select the audio source and click **Apply**.

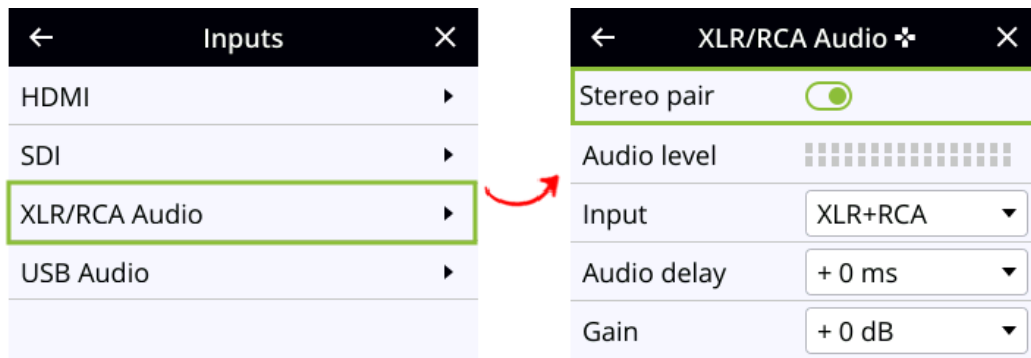


Assign the audio source to an input using the front screen

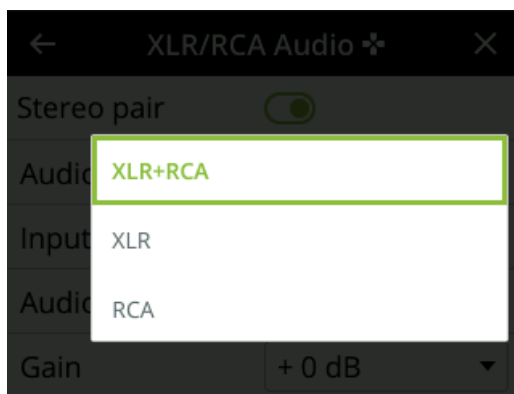
1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **Inputs**. Then from the Inputs screen, select **XLR/RCA Audio** to open the XLR/RCA Audio screen.



- 3. From the XLR/RCA Audio screen, highlight **Input** and press the **check mark** key to display options.




- 4. Highlight the option you want, then press the **check mark** to select and return to the previous screen. To return to the previous screen without making a selection, press the **left arrow** key.

Adjust audio gain and delay

Pearl Nano does not introduce audio delay and has 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 from the front screen menu or using the Admin panel . By default, there's 0 ms of delay applied to audio sources.

The analog audio input ports on 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 Nano. Use an audio mixing board or preamp to amplify microphones and supply the appropriate line level input.

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 Nano 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 21 Audio input port gains guidelines

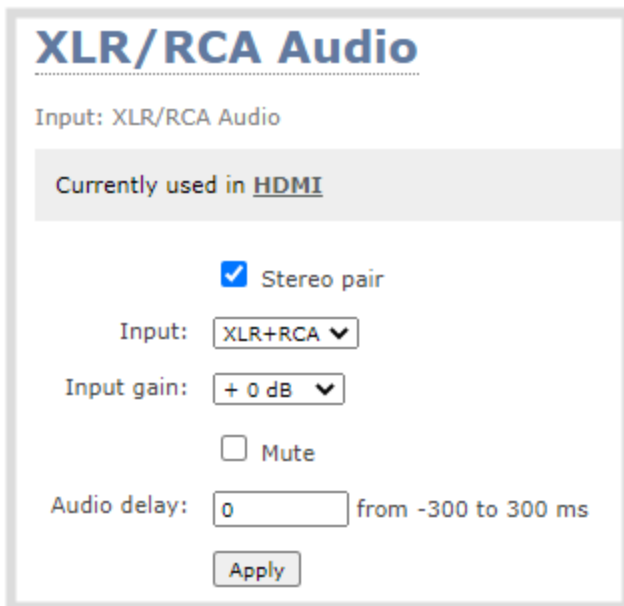
Audio source	Input port	Gain
Mobile phone or other consumer line level device	XLR	Add +6 to +12 dB gain to the audio input port.
	RCA ¹	Nominal
Professional mixer	XLR	Nominal
	RCA ¹	Not recommended.
USB microphone	USB	Nominal
Dynamic, condenser, or electret microphones	XLR	Not recommended. To connect 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/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 Nano before proceeding.

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

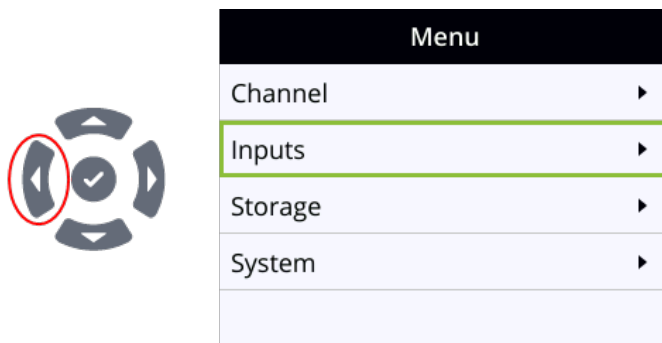
1. Login to the Admin panel as **admin**. See [Connect to Admin panel](#).
2. From the Inputs menu, select an audio source. The audio configuration page for the audio source opens.



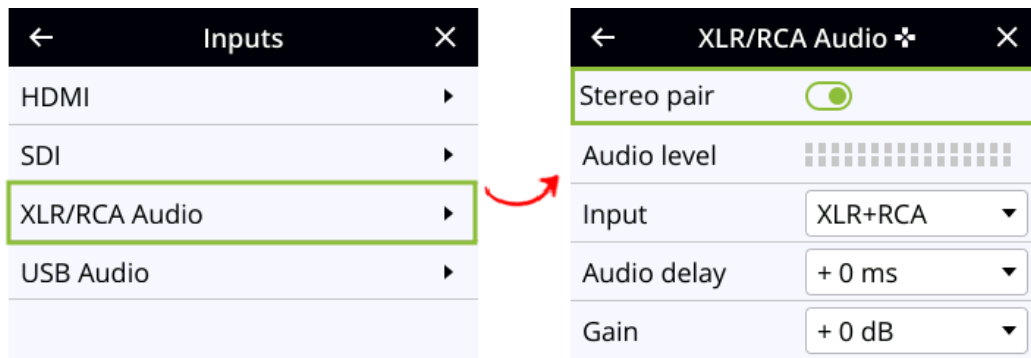
3. In the **Input Gain** field, select the amount of gain to apply to the audio source.
4. In the **Audio delay** field, enter a value between 300 and -300 ms. A positive value adds delay to the audio signal. A negative value adjusts the audio to start earlier.
5. Click **Apply**.

Adjust the gain and delay for an audio source using the front screen

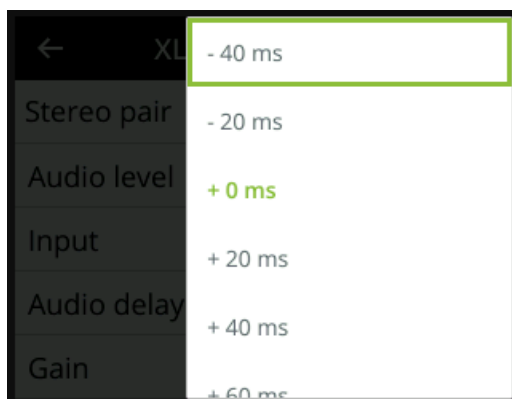
1. Repeatedly press the **left arrow** key on the control interface until the Menu screen displays.



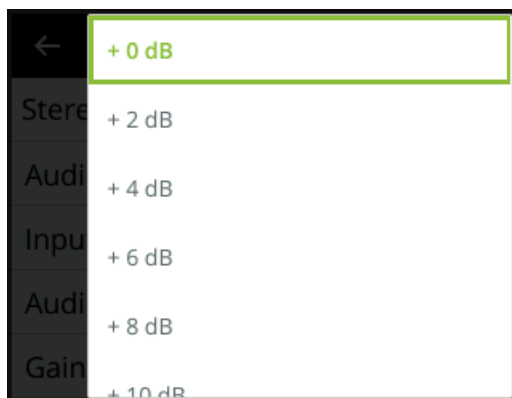
2. Use the arrow and check mark keys to select **Inputs**. Then on the Inputs screen, select **XLR/RCA Audio** to open the XLR/RCA Audio screen.



- 3. To adjust audio delay from the XLR/RCA Audio screen, highlight **Audio delay** and press the **check mark** key to display options.



- 4. Highlight the amount of delay you want using the up and down arrow keys, then press the **check mark** key to select and return to the previous screen. To return to the previous screen without making a selection, press the **left arrow** key.
- 5. To adjust the gain from the XLR/RCA Audio screen, highlight **Gain** and press the **check mark** key to display options.



- Highlight the amount of delay you want using the up and down arrow keys, then press the **check mark** key to select and return to the previous screen. To return to the previous screen without making a selection, press the **left arrow** key.

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.

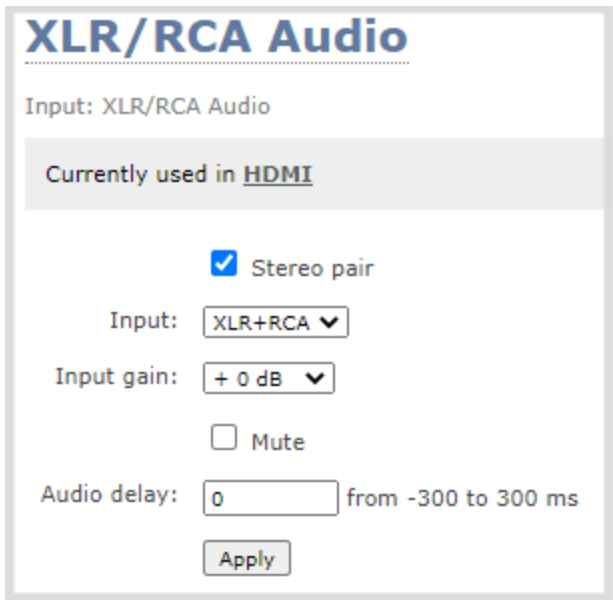
Some audio input ports share internal audio processing resources in Pearl Nano. Muting an audio input that shares internal resources mutes all the associated audio sources. The following table lists the audio input ports that share internal processing and the results of applying mute.

Table 22 *Muting audio inputs that share resources*

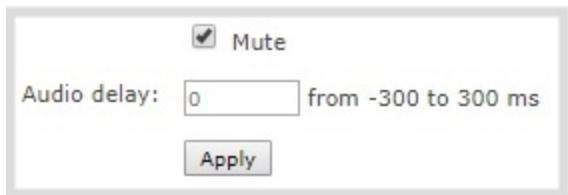
Audio input (Admin panel)	Shared audio input resources	Results
XLR/RCA Audio	XLR (left/right) RCA (left/right)	<p>In stereo mode:</p> <p>Both XLR ports (left and right) are muted.</p> <p>Both RCA ports (left and right) are muted</p>
		<p>In mono mode (XLR/RCA audio Left muted):</p> <p>Both the XLR 1 (left) and RCA left ports are muted.</p> <p>The XLR 2 (right) and RCA right ports are not muted.</p>
		<p>In mono mode (XLR/RCA audio Right muted):</p> <p>Both the XLR 2 (right) and RCA right ports are muted.</p> <p>The XLR 1 (left) and RCA left ports are not muted.</p>

Mute an audio source using the admin panel

- Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
- 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**.



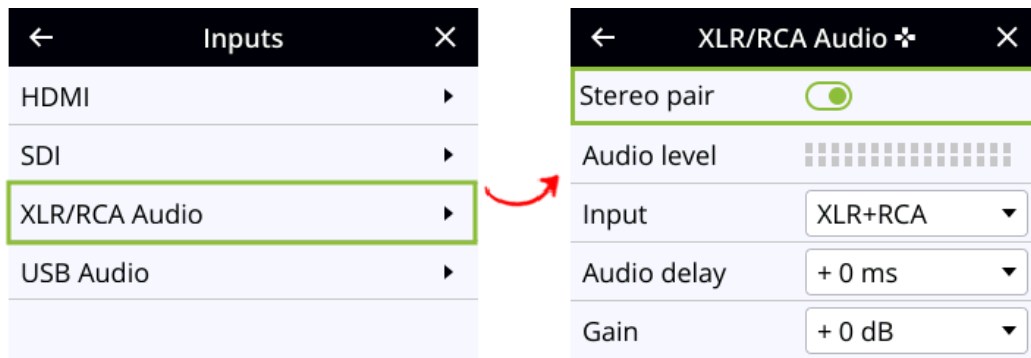
Mute an audio source using the front screen

1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.

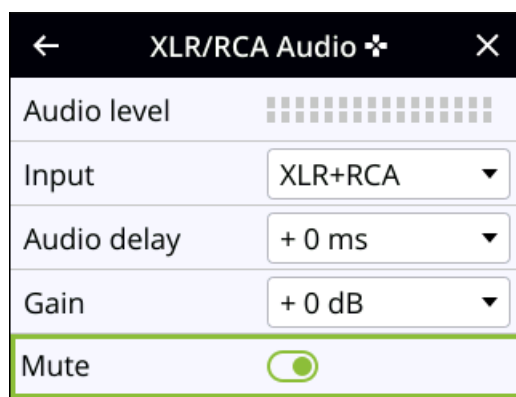


Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

2. Use the arrow and check mark keys to select **Inputs**. Then from the Inputs screen, select **XLR/RCA Audio** to open the XLR/RCA Audio screen.



- 3. From the XLR/RCA Audio screen, press the **down arrow** key repeatedly until **Mute** appears on screen and is highlighted.



- 4. Press the **check mark** key to toggle the switch on or off.

Video output ports

The HDMI video output port can send video from Pearl Nano 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 front screen menu on Pearl Nano to send any video source or channel to the video output port with (or without) the audio.

Topics include:

- [About video output ports](#)
- [Video output port resolution](#)
- [Set up the video output port using the Admin panel](#)
- [Select the video output source using the front screen menu](#)
- [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](#)

About video output ports

An HDMI video output port is located on the rear panel of Pearl Nano. The HDMI OUT port is set to display the Auto channel by default, but you can change this using the Admin panel . The video output port is 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.



Pearl Nano also has an HDMI video pass through port that outputs the HDMI IN signal with no added latency. The HDMI PASS-THROUGH port is not user configurable and does not modify the input video signal that is passed through.



Using the video output port takes CPU cycles and adds to the overall load on your Pearl Nano. 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 or the front screen menu. 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.
- Using the video output ports adds to the overall system load on Pearl Nano. If your system has a high system load and you're using the video outputs, monitor the frame rate of your channels on Pearl Nano 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, and adjusting the encoding bitrates.


Related links

[Set up the video output port using the Admin panel](#)

[Select the video output source using the front screen menu](#)

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 Nano always assumes 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.

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 with 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. Audio is not supported when sending a video input source to the output port.

 The HDMI pass-through port only displays the identical video signal with audio that is received at the HDMI IN port on Pearl Nano.

Important considerations

To select the video you want to appear on the output port using local console or the front screen menu, 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 Admin panel](#).
2. From the Output ports menu, click the output port . 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.

Value	Description
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

Value	Description
	resolution with the display (generally this ends up being the display's default resolution).
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.
1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080	Choose a specific resolution for the output port. For an explanation of the different choices, see Set up the video output port using the Admin panel .


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.


 Decoupled audio sources appear as a single, stereo audio source. You cannot select individually decoupled audio sources.

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).

Select the video output source using the front screen menu

It's easy to change the video source that appears at the video output port using the front screen menu on Pearl Nano. 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**.

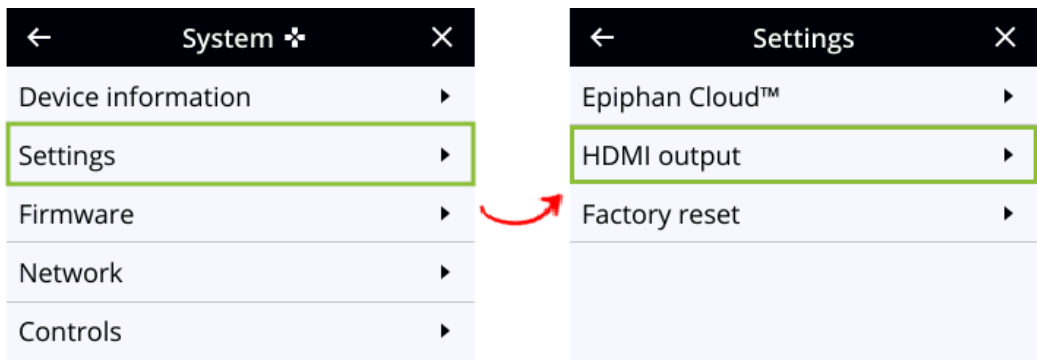
Select the video output source using the front screen menu

1. Press the **left arrow** key repeatedly on the control interface until the Menu screen displays.

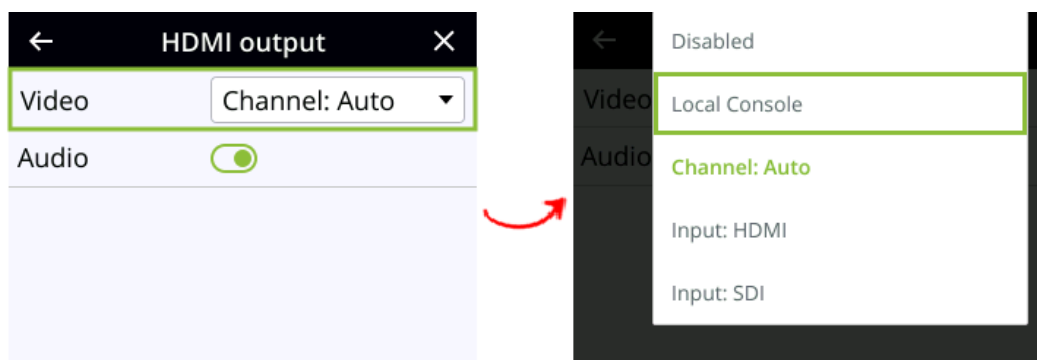


Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

2. Use the arrow and check mark keys to select **System**. Then from the System screen, select **Settings** to open the Settings screen.



- 3. From the Settings screen, select **HDMI output** to open the HDMI output screen, then press the **check mark** key to select Video. The available video sources display.



- 4. Highlight the video source you want, then press the **check mark** key to select and return to the previous screen. To return to the previous screen without making a selection, press the **left arrow** key.

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.

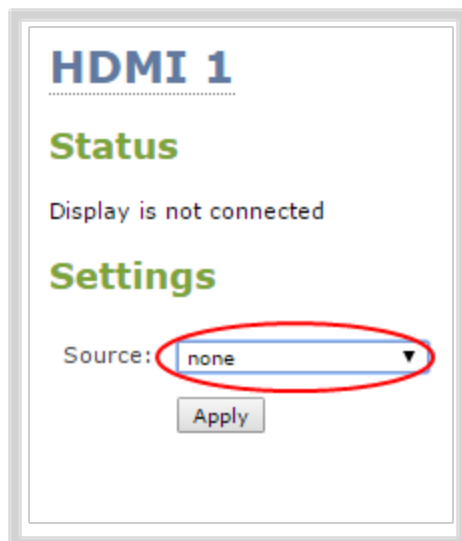
If the video output port is showing a channel and that channel is unavailable or has no signal, a no signal message is shown for 2.5 seconds, then the display output is changed to a black screen.

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.

Disable the video output port using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Output ports menu, click the output port (**HDMI 1**). 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.

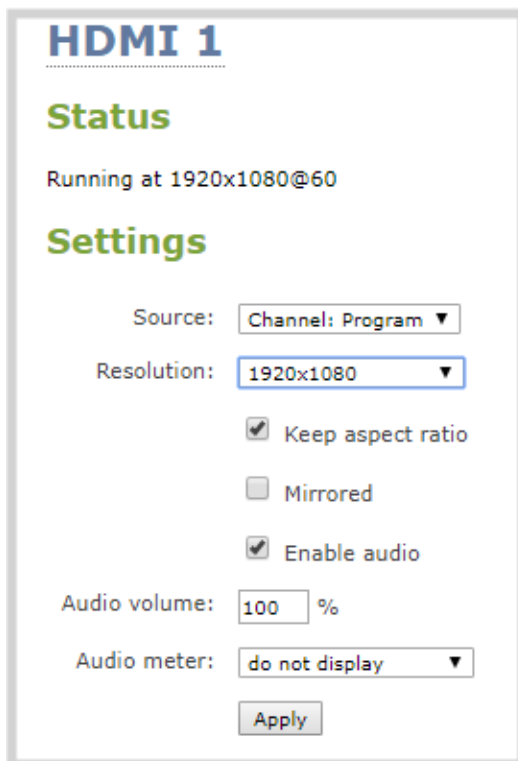


Decoupled audio sources appear as a single, stereo audio source. You cannot select individually decoupled audio sources.

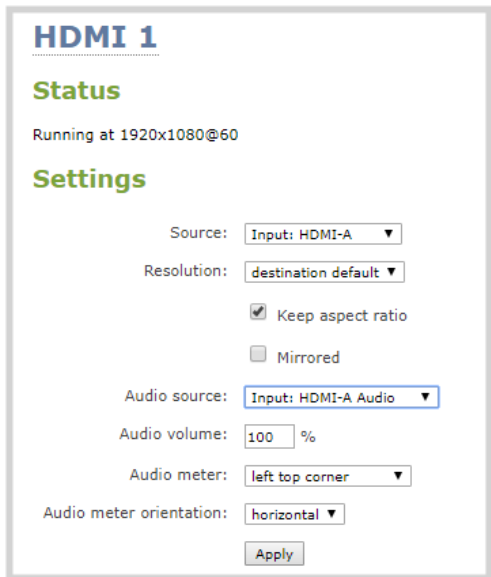
Disable audio for a channel on the video output port and adjust the volume using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Output ports menu, click the output port (**HDMI 1**). 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**.

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 Admin panel](#).
2. From the Output ports menu, click the output port (**HDMI 1**). 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.
right top corner	Audio meter is displayed at the top right side of the display.

Value	Description
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.

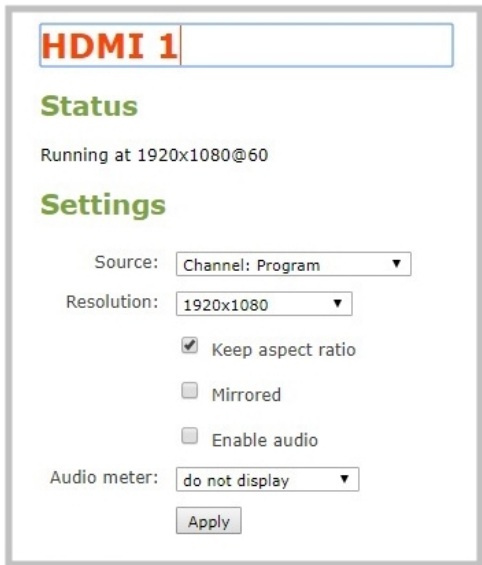
4. If you've selected a location for the audio meter, you can also select an orientation (horizontal or vertical) in the **Audio meter orientation** field.
5. Click **Apply**.

Rename a video output port


Using the Admin panel , you can easily change the video output port default name from HDMI 1 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 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

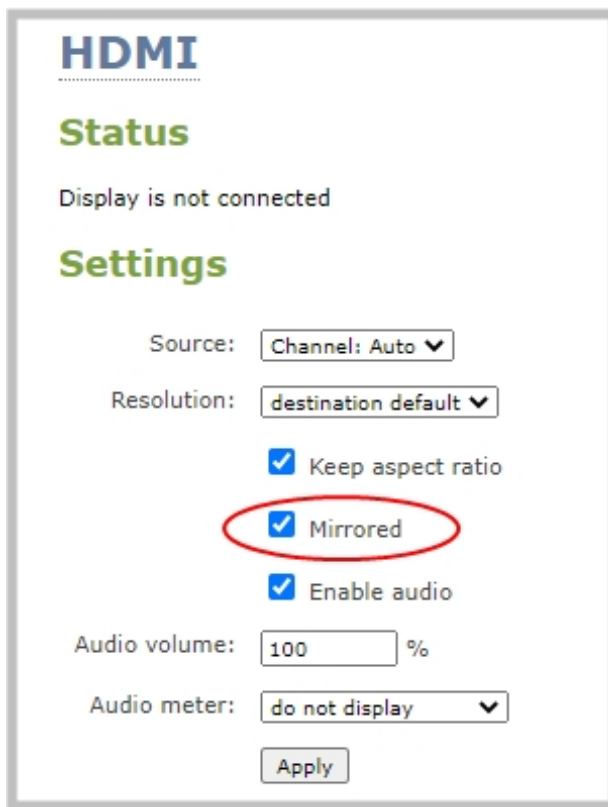
You can use the Admin panel to mirror the original video source on the output port so that it appears reversed on the connected display. If there's an on-screen image that includes text such as a custom no signal image, the text will appear reversed.



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

1. Login to the Admin panel as **admin**, see [Connect to 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 an external keyboard

Instead of using the built-in virtual keyboard on Pearl Nano's front screen, you can connect a USB keyboard to Pearl Nano and use that. Simply enable the external keyboard feature using the Admin panel.

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.

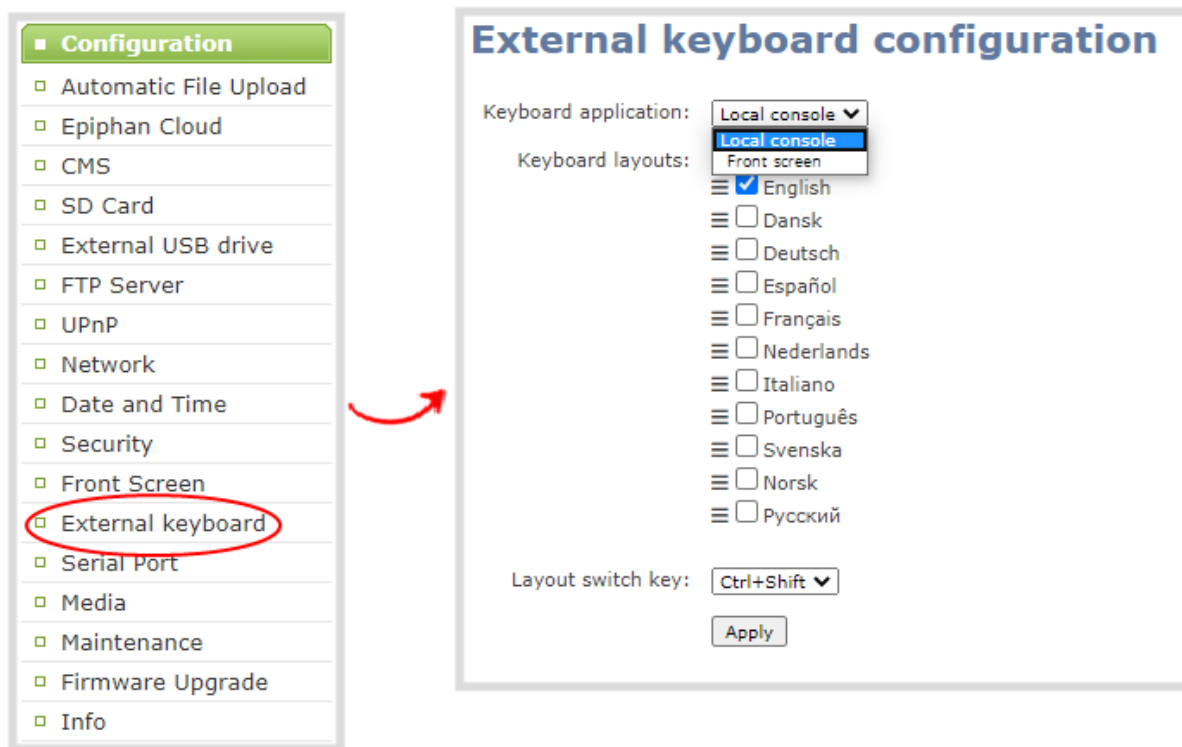
- American English (default)
- Dutch
- French
- German
- Italian
- Netherlands
- Norwegian (Bokmal)

- 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 **Front 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?

Connect your USB keyboard to a USB port on Pearl Nano.

Connect a USB status light

Pearl Nano supports 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 the USB port on Pearl Nano.

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 Pearl Nano and flashes once.

Table 23 Status light indicator

Light	Description
Solid off	Pearl Nano 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.

User administration

Pearl Nano has three configured users: admin, operator, and viewer. By default, none of these users have passwords assigned. For higher security, we recommend setting admin, operator and viewer-level passwords on Pearl Nano.

Topics include:

- [User types and privileges](#)
- [Assign administrator privileges to operators](#)
- [Set or change user passwords](#)
- [Remove user passwords](#)
- [Overcome lost passwords](#)
- [Configure LDAP user authentication](#)
- [Change the logged-in user](#)
- [Restrict viewers by IP address](#)

User types and privileges

There are three Pearl Nano user levels:

- Administrator
- Operator
- Viewer

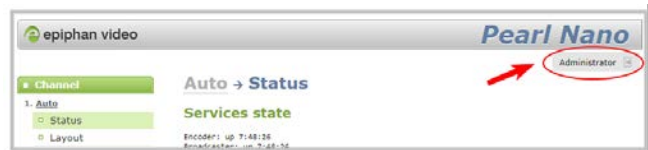
No password is assigned to these user levels by default and you cannot change the default user names or disable these user levels. When you log in to Pearl Nano, you must log in as one of these three user levels. Private profiles with individually set passwords are not used.

You can set an access password for each user level using the Admin panel.



For higher security, we recommend assigning passwords to at least the Administrator and Operator levels because those have access to the Admin panel and can reconfigure Pearl Nano, see **Set or change user passwords**.

When logged in to the Admin panel, the user level is displayed at the top right corner of the screen.



Administrator

The **admin** 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 Pearl Nano remote login access. The default user name used to log in to Pearl Nano is **admin**.

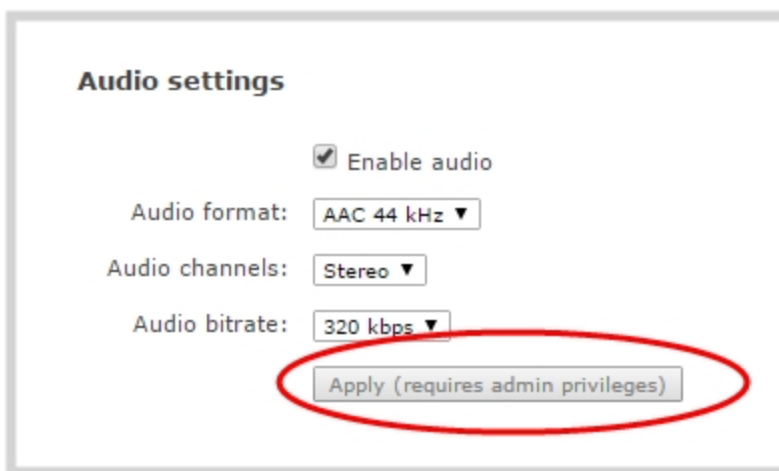
Operator

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

Operators can do the following:

- Configure inputs
- Control recordings (start and stop)
- Rename, download and delete recordings
- Perform network diagnostics

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 **viewer** account is for all users who are permitted to view the streamed channels. The default user name used to log in to Pearl Nano is **viewer**. If no password is assigned, then viewers are not prompted for a user name and password to view a channel. The viewer user name and password prompt appears only if a viewer password is set.

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 24 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			✓
Publish a stream			✓
Configure channel metadata			✓
View recorded files list		✓	✓
Rename recorded files		✓	✓
Download recorded files		✓	✓
Delete recorded files		✓	✓
Input Source Operations			
View input source configuration		✓	✓

Action or Menu Option	viewer	operator	admin
Rename input			✓
Configure input		✓	✓
View input snapshot		✓	✓
Network & security			
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 front screen)	✓	✓	✓
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		✓	✓
Format the SD card			✓
Configure Automatic File Upload (AFU)			✓
Select External USB drive behavior			✓
Cancel USB file transfers		✓	✓

Action or Menu Option	viewer	operator	admin
Configure FTP server			✓
Configure UPnP sharing			✓
Configure network address			✓
Configure date and time preferences			✓
Set or change user passwords			✓
Configure serial port flow control			✓
Upload and delete media			✓
Enable remote support			✓
Backup device configuration			✓
Restore device configuration			✓
Restore factory configuration			✓
Reboot device (Admin panel)			✓
Enable/disable Epiphan Cloud feature			✓
Upgrade Firmware			✓
View System Information		✓	✓
Network Diagnostics			
Bandwidth test		✓	✓
Connectivity status		✓	✓
Domain name resolution		✓	✓
Ping		✓	✓
Probe		✓	✓
Trace route		✓	✓

Assign administrator privileges to operators

Pearl Nano 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 25 Options with additional operator privileges

Option	Operator admin functions
Channel configuration	Rename a channel.
	Configure channel encoder settings
	Configure a custom layout for a channel
	Configure, remove, rename, and publish a stream for a channel
	Configure channel metadata
	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 Pearl Nano
Configuration presets control¹	Create, delete, and apply configuration presets

Option	Operator admin functions
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 Pearl Nano as an FTP server
	Configure UPnP sharing
	Configure the date and time preferences
	Configure the front screen
	Configure the serial port flow control
	Enable/disable Epiphan Cloud feature for remote control and remote login
Maintenance configuration	Video output configuration
	Upgrade firmware
	Apply configuration presets ²
	Enable remote support
	Reboot device (Admin panel)
	Restore factory configuration
Configure the device name, location, and description	

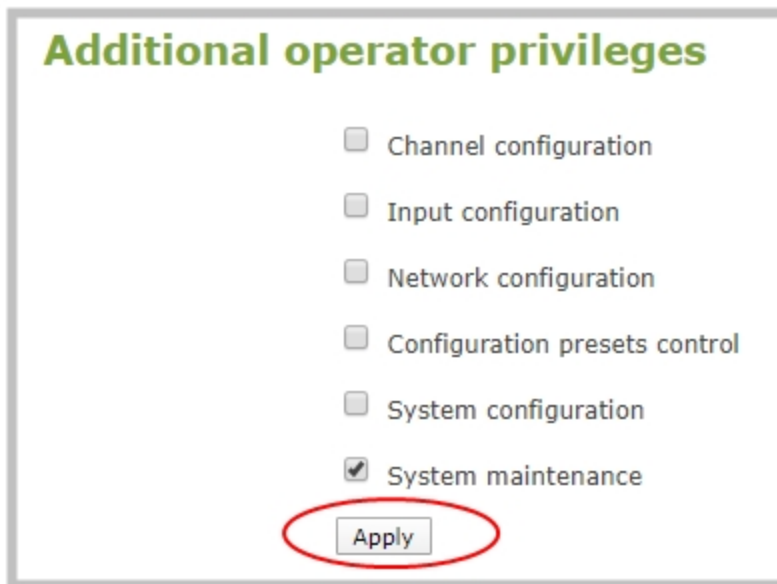
¹Only configuration presets that don't include the System group are allowed.

²Allow 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 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**.



Set or change user passwords

The admin, operator and viewer-level users have no assigned password by default. For higher security, we recommend that you assign a password for at least the admin and operator-level viewers as soon as possible. Admin and operator-level users have access to the Admin panel to control Pearl Nano.



If the admin password is defined and the operator password is undefined, by default the operator must use the admin password.

Passwords are case sensitive and can use all alphanumeric keys in the ASCII range. Your password can be up to 255 characters long, but should not include any spaces. Contact your system administrator for your organization's specific password requirements.

In addition to setting global passwords for viewers, you can also 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](#).



Setting a user's password causes the user to be logged out. Be ready to log back in with the new admin password or have operators and viewers log in with the appropriate new password. Viewers may need to refresh their browser window or press play in their media player.



Changing the admin password while live streaming disrupts the view of the stream for viewer-level users. Complete any admin password changes when there is no live stream in progress.

Set a user password using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Highlight and delete the **current password** for your selected user. Eight dots mask the password regardless of the password's actual length (and appears even if no password is set).
4. Highlight and delete the **confirmation password** for the selected user.
5. Select the user's **password** field and type a new password for the user. The new password must have between 1-255 alphanumeric characters or special characters with no spaces. Passwords are case sensitive.
6. Select the user's **password confirmation** field and confirm the new password.
7. Click **Apply**.

TIP: You can set multiple account passwords before clicking **Apply**.

If you were logged in as the user whose password you just changed, you are logged out and must log back in with the new password. If you added or changed the viewer's password, all viewer's stream will pause until they log in with the new password.

Remove user passwords

You can remove passwords for one or more of the user levels using the Admin panel. If you don't remember the admin password, refer to the section [Overcome lost passwords](#). Note that viewer passwords can be set on a per-channel basis.



Clearing a user's password will cause that user to be logged out. Be ready to log back in with the new admin password. If viewers are watching the broadcast when the viewer password is cleared

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

Clear a user's password using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Highlight and delete the current password for the selected user level. Eight dots mask the password regardless of the password's actual length (and appears even if no password is set).
4. Highlight and delete the **confirmation password** for the selected user, then click **Apply**.
5. If you were logged in as the user whose password you just cleared, you are logged out and must log back in without a password. If you cleared the viewer's password, all viewer streams will pause until they log in without a password.

To clear a user's password on a specific channel:

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select a channel and click **Streaming**. The channel's Streaming configuration page opens.
3. From the Access control section, do one of the following:
 - a. Clear the **viewer password** field.
 - b. Select **Use global settings** from the access control drop down.
4. Click **Apply**.

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 [Set or change user passwords](#).

If you have lost the admin password and you have remote support enabled on the system, 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 Pearl Nano if you apply the factory default configuration preset using the front screen menu, see [Apply a configuration preset using the front screen menu](#). The factory default configuration will change the current settings on Pearl Nano, see [The Factory default configuration preset and Factory reset](#).

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. See **Configure LDAP user authentication**.

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 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.

LDAP authentication:

Enable LDAP authentication

Server address[:port]

Connection encryption No encryption ▼

Bind DN

Bind password

Base DN

Search attribute

Administrators (group DN)

Operators (group DN)

Viewers (group DN)


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 search attribute is *uid*, which is suitable for a unix environment. You can specify a different value in the **Search 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**.
13. Reboot Pearl Nano. From the Configuration menu, select **Maintenance** and click **Reboot Now** on the maintenance page.
14. After the system has finished rebooting, log back in to the Admin panel as admin and verify that all changes were applied.

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.

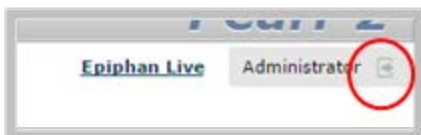
 Users are required to authenticate once to the system and one time per channel they view. Therefore users see a prompt to log in to the system (the system name is shown) and a second time to log in to the channel (the channel name is shown).


Change the logged-in user

After you log in to the Admin panel as an Administrator or Operator, your browser remembers this configuration and automatically logs you in using the same user account the next time you log in to Pearl Nano.

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 login 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.

Restrict viewers by IP address

Pearl Nano permits 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.

Item	Description
Allow IP's	<p>Users connecting from addresses in this list are permitted to view broadcasts from the system, provided their IP address is not in the Deny IP's list.</p> <p>To allow all except IP addresses in the deny list, if any, leave the field blank.</p> <p>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.</p>
Deny IP's	<p>Users connecting from addresses in this list are not allowed to view broadcasts from the system, 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.</p> <p>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.</p>

If your viewer account has a password, your viewers must connect to the system 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.

Table 26 IP Based Restriction Options

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 on a channel by their IP address

1. Login to the Admin panel as **admin**, see [Connect to 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 example allow lists.

Table 27 Example allow lists

Example	Description
Allow list with distinct IP addresses	<p>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.</p> <p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Allow: 192.168.1.50, 192.168.1.51, 192.168.1.75</p> </div>
Allow list with a range of IP addresses	<p>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:</p>

Example	Description
	<p style="text-align: center;">Allow: 192.168.1.200-192.168.1.250</p> <p>Note that we could have specified two of the IP addresses in the previous example as a range.</p>
<p>Allow list with a range of IP addresses and one or more specific IP addresses</p>	<p>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:</p> <p style="text-align: center;">Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75</p> <p>Your list can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.</p>
<p>Allow list with a range of IP addresses, distinct IP addresses, and an exception</p>	<p>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:</p> <p style="text-align: center;">Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75</p> <p style="text-align: center;">Deny: 192.168.1.211</p> <p>Both lists can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.</p>

The following table lists some example deny lists.

Table 28 Example deny lists

Example	Description
Deny list with distinct IP addresses	<p>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.</p> <p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p>Deny: 192.168.1.211</p> </div> <p>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.</p>
Deny list with a range of IP addresses	<p>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).</p> <p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p>Allow: 192.168.1.1-192.168.1.250</p> <p>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</p> </div>

Configuration presets

Configuration presets are the perfect solution for backing up your system configuration and if you have changing configuration requirements for your Pearl Nano 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](#)
- [Apply a configuration preset using the front screen menu](#)
- [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 Nano systems and shared spaces, like a studio, a breeze to set up and maintain a consistent setup each time you go to use your Pearl Nano.

Configuration presets let you quickly apply settings to your Pearl Nano so you can reconfigure it on the fly and get a consistent set up each time. You can even download a configuration preset and upload it to other Pearl Nano systems.

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. For a complete list of individual settings that are included in each configuration group, see [About configuration presets](#).

- System
- Network
- Inputs

- EDID
- Channel
- Automatic File Upload
- Content Management System
- Epiphan Cloud
- Front screen
- Output port

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 Nano 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, network 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 Nano 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 either the Admin panel or the front screen menu on Pearl Nano. When applying the configuration preset, all other preset groups remain unchanged. The preset only affects channels and their configuration.

Session 1 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
- The potential to lock the front screen
- Recording and streaming states
- Recorded files in a channel
- Orphaned Kaltura resource registrations and duplicate resources

Access to presets and privacy considerations

- Recorded files are not removed when you apply a configuration preset. Any user with access to Pearl Nano 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 presets 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.



Media files that you've uploaded to Pearl Nano (logos, background images, etc) are included in the configuration preset and must be present on the system when creating a preset that includes the **Channel** group; otherwise, a failure is reported.

Locking out the front screen

The **front screen** configuration group includes the PIN security setting for the front screen. It's possible to apply a preset that effectively locks out all further use of the front screen. If this happens, use the Admin panel to reset or disable the PIN, see [Set a PIN security code](#).

Recording and streaming states

The **channel** configuration group includes recording and streaming states for channels. This means that if a channel is streaming or a channel is recording at the time you create a configuration preset, the channel will immediately start recording (or streaming) whenever you apply that preset to the channel. Similarly, if a configuration preset is created when a channel is not recording (or streaming), applying that preset later won't cause the channel to start recording (or streaming).



This means a channel may stop recording or streaming as a result of applying the preset if the channel was actively recording or streaming before applying the preset.

For example, when applying a preset to a channel set to record (the same example applies for streaming):

- If the channel is already recording, the file continues recording uninterrupted unless the recording file type in the applied preset is different. In that case, a new file is started and recording resumes using the

new file.

- If the channel is not already recording, it immediately begins recording when the preset is applied.

Recorded files in a channel

The channel keeps a list of recordings in the Channel menu's **Recordings** page in the Admin panel. These recordings remain on the system even if the channel configuration is changed as a result of applying a configuration preset.

Furthermore, if you delete any of the recordings, you are deleting the *only* instance of those files. For example, if you delete one of five recordings from the channel after creating a configuration preset, you'll find that even after applying the preset, the channel will still have only four recorded files.

Orphaned Kaltura resource registrations and duplicate resources

Returning Pearl Nano to the factory defaults using the factory default configuration preset or performing a factory reset does not delete the registered resource instance in Kaltura CMS. In that case, you can reregister your Pearl Nano using the same resource name and take over for the resource instance that is still registered in Kaltura, see [Reassign a registered resource](#).

If you apply a configuration preset to set up a replacement Pearl Nano with the settings from a Pearl Nano that is currently registered with Kaltura, the replacement Pearl Nano assumes the identity of the registered resource. However, you risk having two active Pearl Nano resources with the same identity, which can effect recording and the content that's uploaded to Kaltura for scheduled events.

To remove the risk of having two active devices with the same registered resource identity in Kaltura, we recommend powering down one of the Pearl Nano resources, then disconnect it from the network and consider performing a factory reset or applying the factory default configuration preset.

Configuration groups

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

Table 29 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, deny/allow lists and LDAP configuration settings.
Network	Network settings.
Inputs	All audio and video source configuration settings (including no signal images) except EDID

Group Name	Settings included in the configuration group
	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	All channel configuration data and current recording state, the custom layout, images used in layouts, streaming state, all recording configuration data and current recording state, individual and global UPnP settings.
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 (i.e. Kaltura and Panopto).
Epiphan Cloud	Epiphan Cloud pairing and encoder selection information.
Front screen	Front screen PIN 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 Nano, 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 30 Factory default configuration preset vs a factory reset

Item	Factory default configuration preset	Factory reset function
Resets the channel settings	✓	✓
Deletes all recorded files in the channel		✓
Resets network configuration	✓	✓
Resets front screen PIN	✓	✓
Resets user passwords	✓	✓

Item	Factory default configuration preset	Factory reset function
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 Pearl Nano, you can:

- [Apply a configuration preset using the Admin panel](#)
- [Apply a configuration preset using the front screen menu](#)

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 Pearl Nano to the factory defaults or performing a factory reset does not delete the registered resource instance in Kaltura CMS. You can reregister your Pearl Nano 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're finished configuring your Pearl Nano, 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 that include **network** or **system** settings require a system reboot when applied.

Important considerations

- 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. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance** . The maintenance page opens.
3. In the **Configuration presets** section, enter a name for your configuration preset in the **Name** field.

Create a configuration preset

Name:

Sections

- System
- Network
- Inputs
- EDID
- Channel
- Automatic File Upload
- Content Management System
- Epiphan Cloud
- Front screen
- Output port

4. Check the configuration groups you want to include in the preset. For a full system backup, select all groups.
5. Click **Save**. Your configuration preset appears in the list.

What's next?

You can export the configuration preset to your admin computer and then import it to another Pearl Nano, see [Export and import configuration presets](#), and you can [Apply a configuration preset using the Admin panel](#)

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 **channel** 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.

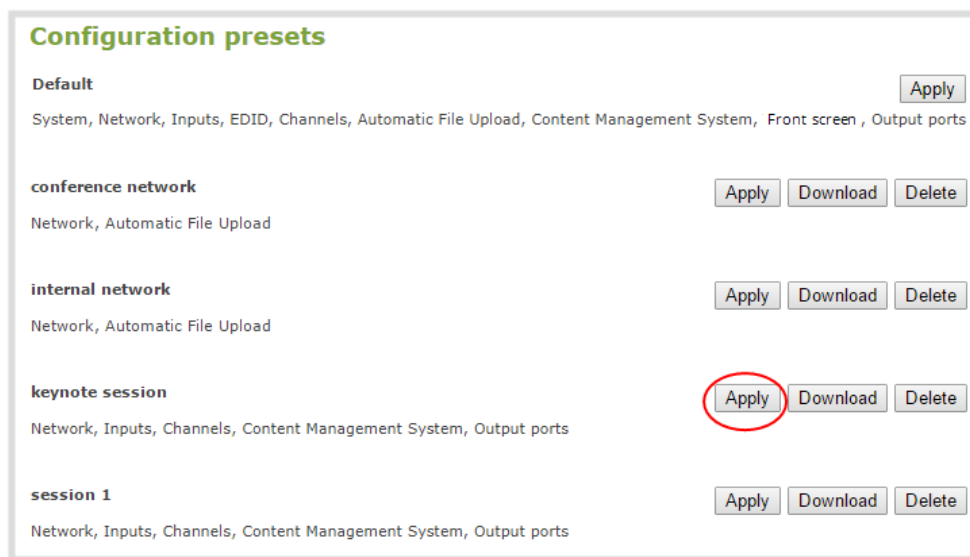
You can verify which configuration groups are included in a preset by looking at the list to the right of the configuration preset name. The term 'all' means all groups are included. Otherwise groups are listed individually.



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. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. In the **Configuration presets** section, click the **Apply** button next to the configuration preset you want to apply. Click **OK** when prompted. Pearl Nano reboots automatically if the configuration preset includes the **network** or **system** configuration groups.



Preset Name	Configuration Groups	Apply	Download	Delete
Default	System, Network, Inputs, EDID, Channels, Automatic File Upload, Content Management System, Front screen, Output ports	Apply		
conference network	Network, Automatic File Upload	Apply	Download	Delete
internal network	Network, Automatic File Upload	Apply	Download	Delete
keynote session	Network, Inputs, Channels, Content Management System, Output ports	Apply	Download	Delete
session 1	Network, Inputs, Channels, Content Management System, Output ports	Apply	Download	Delete

Apply a configuration preset using the front screen menu

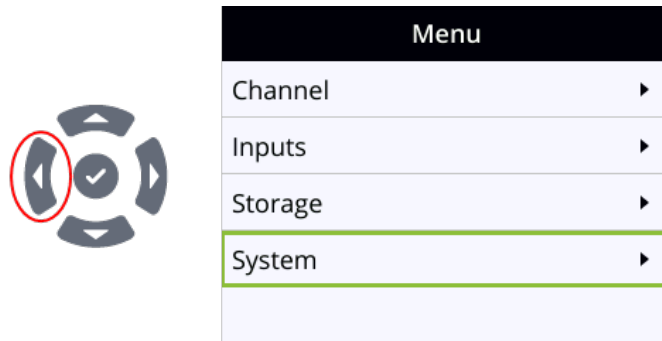
You can use Pearl Nano's front screen menu to apply configuration presets. Configuration presets that only contain the **network** configuration group can also be applied using an alternative method, which is also

described in this procedure.

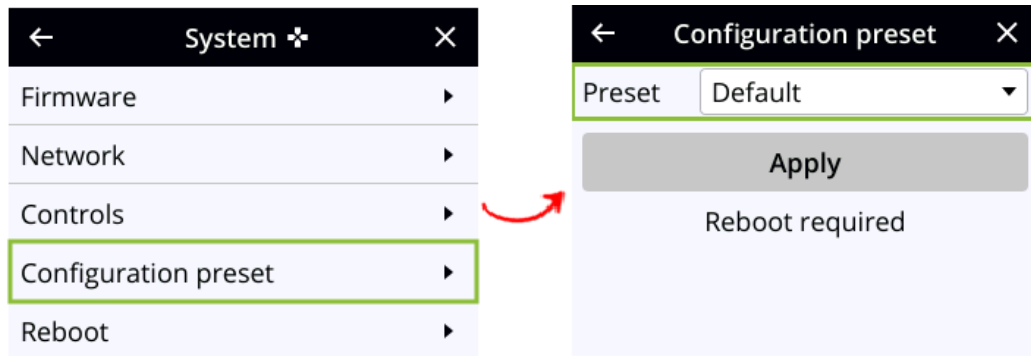
If you apply a preset that has the EDID configuration group, the system may appear unresponsive for a short time while it applies these EDIDs to the video grabbers.

Apply a configuration preset using the front screen menu

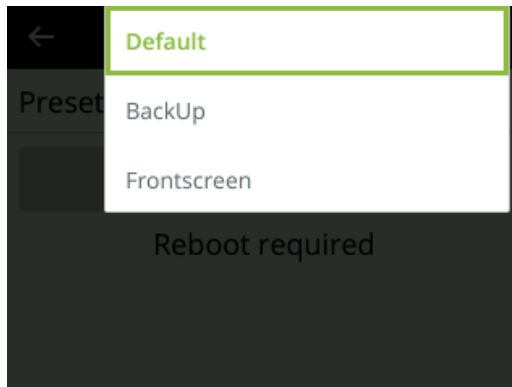
1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



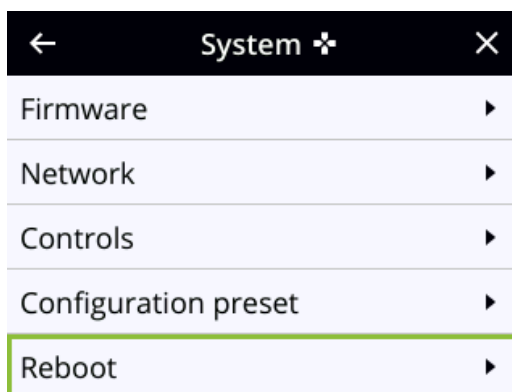
2. Use the arrow and check mark keys to select **System**. Then from the System screen, scroll down using the arrow key and select **Configuration preset** to open the Configuration preset screen.



3. From the Configuration preset screen, highlight **Preset** and press the **check mark** key to expand the list of available presets, then use the arrow keys to highlight the name of the preset you want. Press the **check mark** key to select it.




4. From the Configuration preset screen, use the down arrow key to highlight **Apply** and press the **check mark** key to apply the selected configuration preset. The selected configuration preset is shown in the Preset field of the Configuration preset screen.
5. If prompted, reboot Pearl Nano to apply the configuration preset. Return to the System screen and use the down arrow key to scroll down until Reboot appears. Then select **Reboot** using the **check mark** key and select **Reboot now** when prompted.



Export and import configuration presets

You can download configuration presets to your local computer, then upload and apply the preset to other Pearl Nano systems 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.



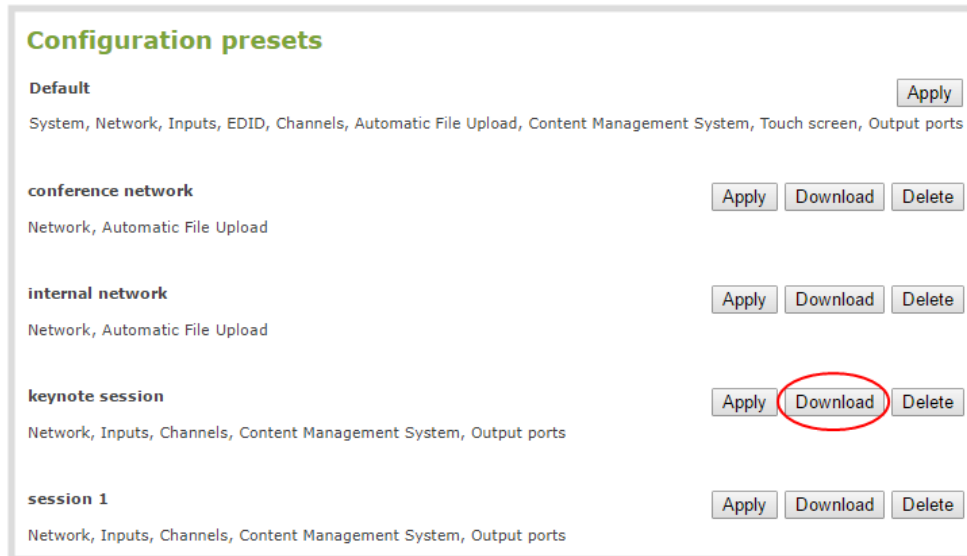
You cannot download/upload configuration presets using the local console on Pearl Nano. Use the web-based Admin panel instead.

Before you begin

Read [Configuration preset considerations](#).

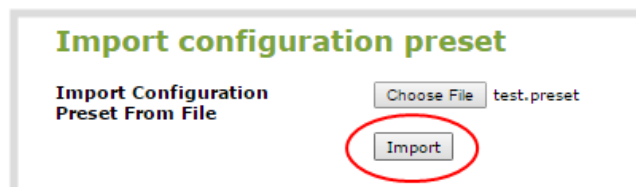
Download or export a configuration preset using the Admin panel

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

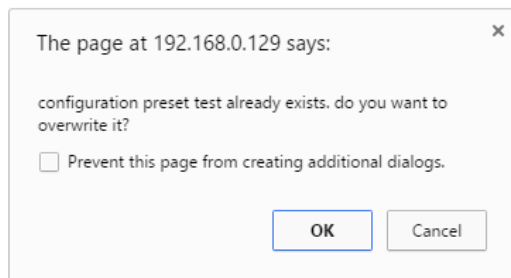


Import a configuration a preset using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. In the **Import configuration preset** section, click **Choose file** and browse to 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 Nano. To apply the configuration preset, see [Apply a configuration preset using the Admin panel](#) or [Apply a configuration preset using the front screen menu](#).

Update a configuration preset

To update a configuration preset and add or remove different configuration groups using the Admin panel, you simply create a new configuration preset with the same name so that it overwrites the existing one.

Update a configuration preset using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance**. The maintenance page opens. All existing configuration presets are listed in the **Configuration presets** section.

Create a configuration preset

Name:

Sections

- System
- Network
- Inputs
- EDID
- Channel
- Automatic File Upload
- Content Management System
- Epiphan Cloud
- Front screen
- Output port

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.

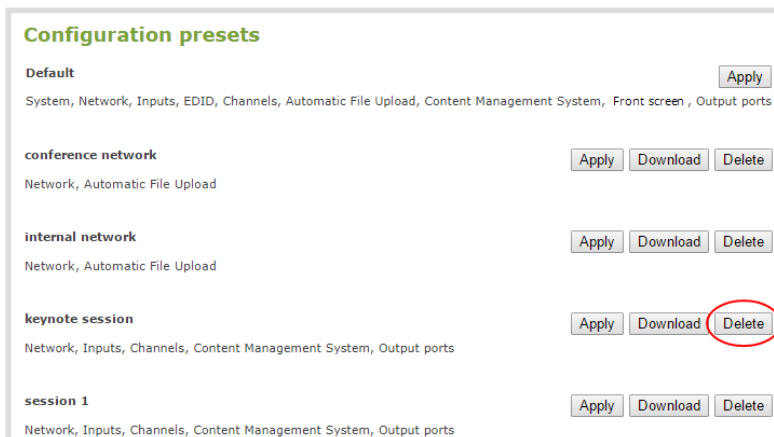
Delete a configuration preset

You can delete all configuration presets at once by doing a factory reset, or you can delete individual configuration presets from the **Maintenance** page. You cannot delete the Factory default configuration preset.

Delete a configuration preset using the Admin panel

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



Status and monitoring

Pearl Nano lets you monitor audio and check the status of your channels, live streams, and recordings.

Topics include:

- [Monitoring audio](#)
- [Confidence monitoring using the front screen](#)
- [View system status using the front screen menu](#)
- [View system information using the Admin panel](#)
- [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](#)

For a description of the front panel LEDs on Pearl Nano, see [Front and back view of Pearl Nano](#).

Monitoring audio and VU sensitivity

You can connect headphones to the 3.5 mm audio jack on the front panel of Pearl Nano and monitor audio for the channel. To monitor audio for the channel, make sure the Channel view is displaying on the front screen. The audio you hear depends on the channel's custom layout. That's because you can choose different audio sources on the custom layout. To monitor audio for a specific video source, make sure the screen for the video source is displaying on the front screen.

To adjust the headphone volume, use the up and down arrow keys on the control key interface when the Channel view or one of the video sources is displayed on the front screen. See [Monitoring audio](#) for details.

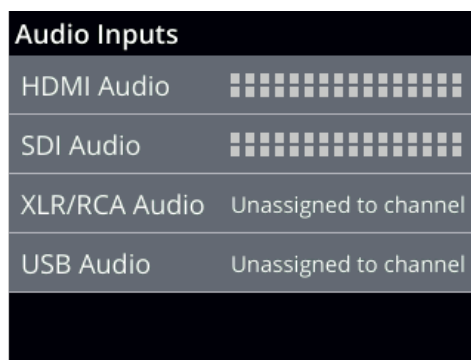


A VU meter on the front screen shows the audio levels for the channel. The value is displayed in dBFS (decibels relative to full scale). Colored bars represent the audio level.

Table 31 Audio VU meter levels

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

You can also monitor the audio VU meters for all audio inputs from the Audio inputs screen. If you don't see the Audio inputs screen displayed on the front screen, press the **left arrow** key on the control key interface to cycle through the different views.



Confidence monitoring using the front screen

Have complete confidence about what you're capturing, streaming, and recording. The Channel view displays your video sources in a custom layout that you can configure using the custom layout editor.

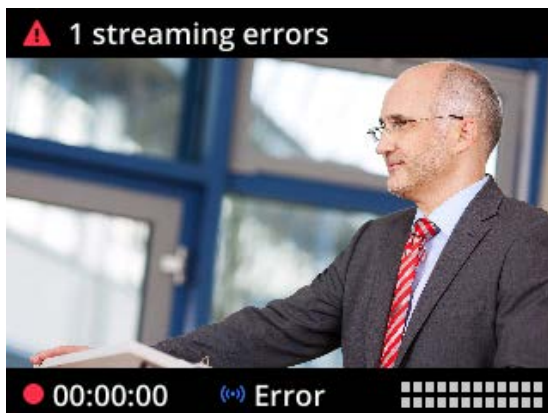
The Channel view opens by default when you turn on Pearl Nano. If you don't see the Channel view displayed on the front screen, press the **left arrow** key (or the right arrow key) on the control key interface to cycle through the different views.



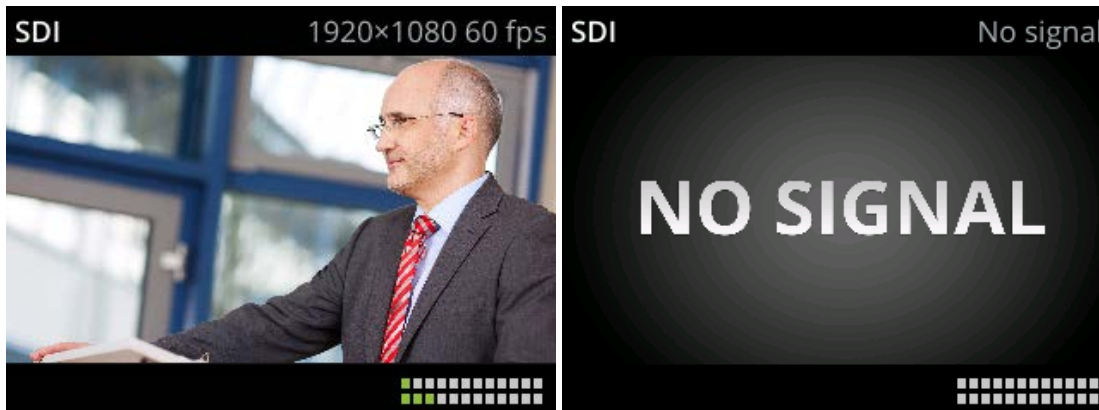
The audio VU meter uses quasi-peak ballistics with samples averaged every 10 ms. The maximum average audio level in each 100 ms period is displayed using colored bars.

- RED = 0 to -9 dBFS
- Yellow = -9 to -18 dBFS
- Green = -18 dBFS and lower

If an error occurs while streaming or recording, an error message appears in the header bar and the word **Error** replaces the related timer in the footer. At the same time, the Stream (or Record) control key on the front panel of Pearl Nano visibly flashes.



You can also monitor a specific video input from the front screen. If you don't see the video input displayed on the front screen, press the **left arrow** key on the control key interface to cycle through the different views. If the video input source has no video signal, the no signal screen displays.



To monitor a different video input or return to the Channel view, press the **left arrow** key on the control key interface to cycle through the different views. To toggle the content displayed in the header and footer bars on and off, press the **check mark** key on the control key interface.

For information about monitoring audio, see [Monitoring audio and VU sensitivity](#).

View system status using the front screen menu

Find the serial number, check the installed firmware version of your Pearl Nano and more on the System Status screen using the front screen and control key interface.

The System Status screen displays basic system information that's useful when first setting up your Pearl Nano. If you don't see the System status screen displayed on the front screen, press the **left arrow** key on the control key interface to cycle through the different views.

System status	
IP address	10.113.1.101
Firmware	4.14.0i
Uptime	07:22
CPU load	9%
SD card	111 GB of 111 GB
USB storage	Not detected

Table 32 System status parameters

Label	Description
IP address	The IP address assigned to Pearl Nano. Use

Label	Description
	this IP address to connect to the Admin panel. To setup networking, see Configure network settings .
Firmware	The firmware that is currently loaded on Pearl Nano.
Uptime	How long Pearl Nano has been powered on displayed as hh:mm .
CPU load	The current amount of CPU load (%).
SD card or SSD	The amount of storage available. SD card only displays if a SATA M.2 2280 SSD is not installed. When an SSD is installed, the field displays SSD instead of SD card.
USB storage	Displays the amount of storage available on a USB storage device that is connected to Pearl Nano.

View system information using the Admin panel

Get useful information about your Pearl Nano 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 Admin panel](#).
2. From the Configuration menu, click **Info**. The system information page opens.

Pearl Nano 900156 info

Status

Date: Tue Feb 02 2021
 Time: 07:36:30 GMT-0500
 Uptime: 22:44
 System Load: 16%

Firmware

Version: 4.14.05
 Revision: 52628_1832
 Date: 2021-01-19

Hardware

Serial number: 900156
 CPU board: x3

Device info

Name:

Description:

Location:

Channels

#	Name	Status	Recording	Streaming	Video inputs	Audio inputs	Codec	Frame size	Bitrate / Actual bitrate	FPS / Actual FPS	
1	Auto	✔	Stopped	No streams	Auto	Auto	H.264+AAC	1920x1080	auto / 5.919 Mbps	30 / 30.000	View

The Bitrate / Actual bitrate values show the total of the video bitrate plus audio bitrate.

View network status

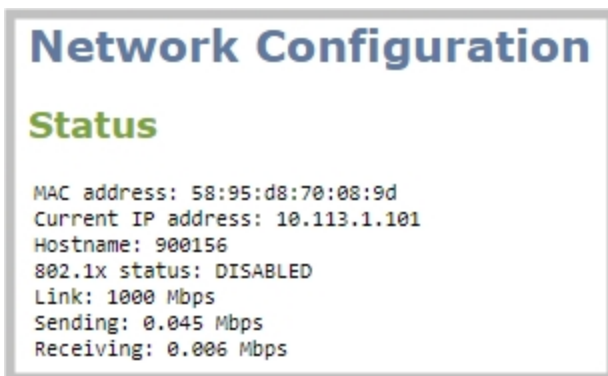
Get useful status information about your Pearl Nano network connection from the Network configuration page using the Admin panel, including:

- MAC address
- Current IP address
- Hostname
- 802.1x status

- Rated Ethernet link speed (Mbps)
- Sending and receiving speed (Mbps)

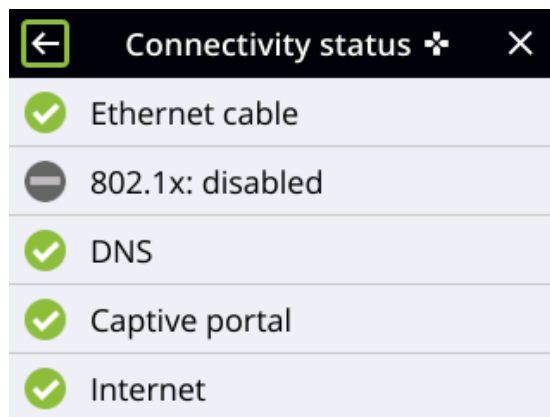
View the network status using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Network**. The Network configuration page opens.



View 802.1x network connection status

You can see the 802.1x network connection status when you run the Connectivity status diagnostic using the Admin panel and from the front screen menu when you select **System > Network > Connectivity Status**. 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 Nano, 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 Nano 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 Admin panel](#).
3. From the Channels menu, click a channel to open the status page for that channel.

The screenshot shows the Admin panel interface. On the left, a 'Channel' menu is visible with 'Status' highlighted. A red arrow points from this menu to the main content area. The main content area is titled 'Auto -> Status' and contains the following information:

Services state

Encoder: up 2:52:20
 Broadcaster: up 2:52:20
 HTTP Live Streamer: disabled
 Recorder: disabled

Stream info

Live broadcast: <http://10.113.1.199/preview.cgi?channel=1>

Video: H.264 1920x1080@30, 5.00 Mbps
 Actual framerate: 30.00
 Audio: AAC 48kHz stereo 320 kbps
 Total: 5.92 Mbps
 Flash stream <http://10.113.1.199:8000/stream.flv>
 MPEG-TS stream <http://10.113.1.199:8000/stream.ts>
 RTSP stream <rtsp://10.113.1.199:554/stream.sdp>

Below the text is a video preview window showing a man in a suit speaking at a podium. At the bottom of the page, there is a 'Connections' section with the text 'No active connections'.

Active unicast and multicast stream information displays under **Connections**.

Connections			
Stream name	Client IP	Bitrate	Bytes transmitted
stream.sdp	192.168.114.115	5868 kbps	221879 KBytes
	192.160.110.105	0 kbps	2 KBytes
stream.ts	192.165.154.211	6491 kbps	385166 KBytes
stream.flv	192.168.114.219	5916 kbps	321166 KBytes
Stream 1	a.rtmp.youtube.com	2669 kbps	47749 KBytes

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 Admin panel](#).
2. From the Output port menu, click the output port (**HDMI**). The video output port configuration page opens.

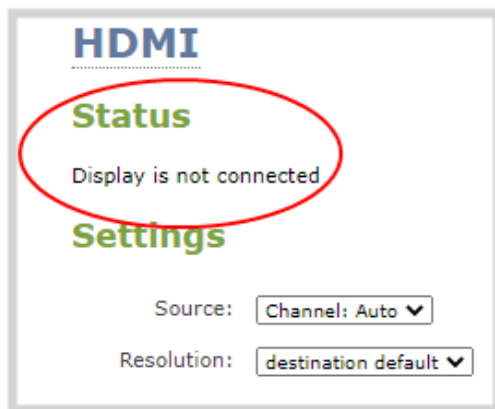


Table 33 Possible video output status messages

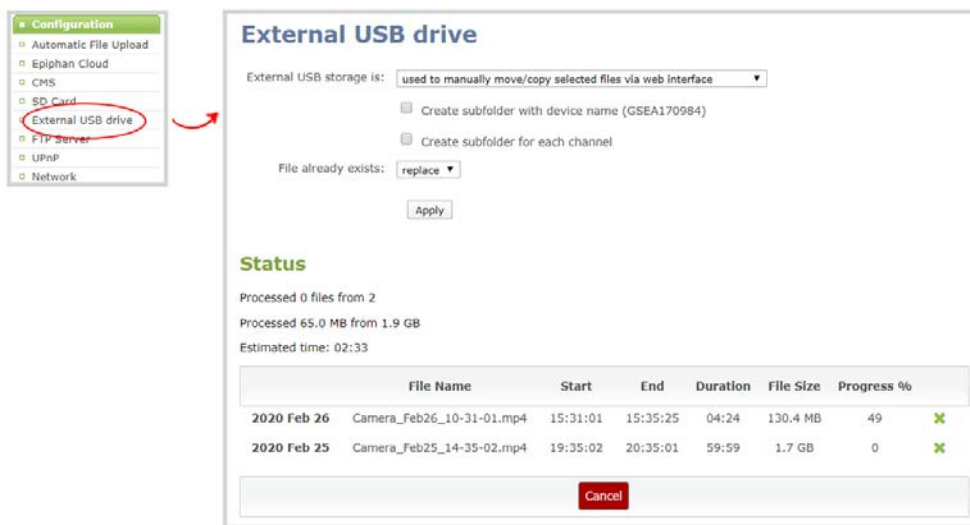
Message	Description
Disabled	This video output port is disabled in the configuration.
Display is not connected	There is no display connected to the video output port or the connected display is not powered on or not functioning.

Message	Description
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 front screen menu .
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.

View AFU and file transfer progress

You can view basic Automatic File Upload (AFU) and file transfer information from the front screen menu or using the Admin panel.

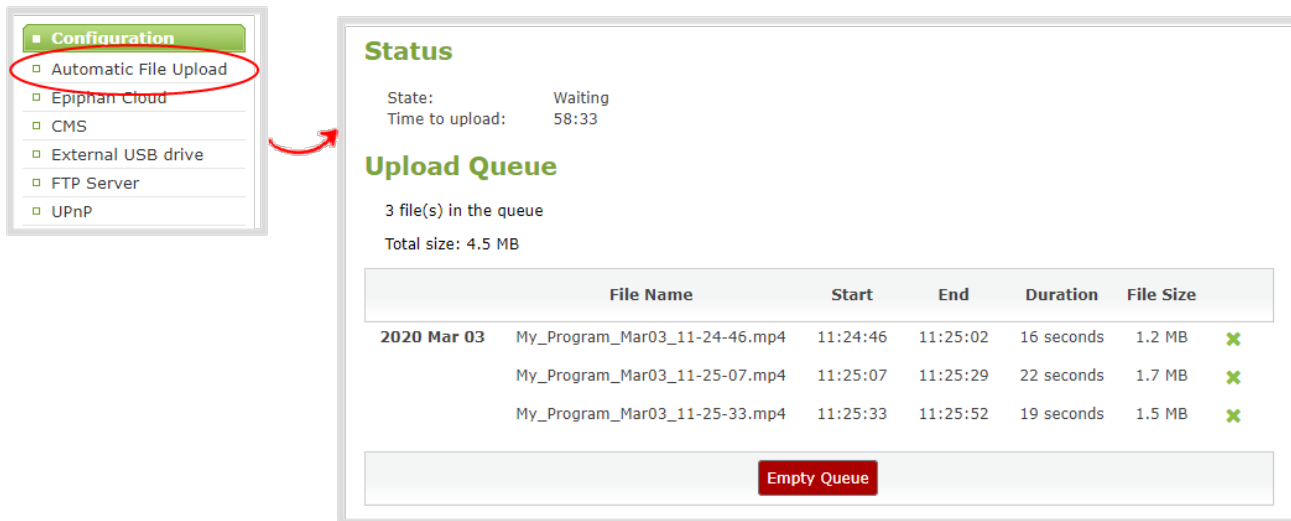
The Admin panel displays a history of uploaded files, which persists until either Pearl Nano is restarted or the list is manually cleared. You can also cancel file uploads manually using the Admin panel.



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 Admin panel](#).
2. From the Configuration menu, click **Automatic File Upload**. If there are files to be uploaded, they appear in the queue.



Configuration

- Automatic File Upload
- Epiphan Cloud
- CMS
- External USB drive
- FTP Server
- UPnP

Status

State: Waiting
Time to upload: 58:33

Upload Queue

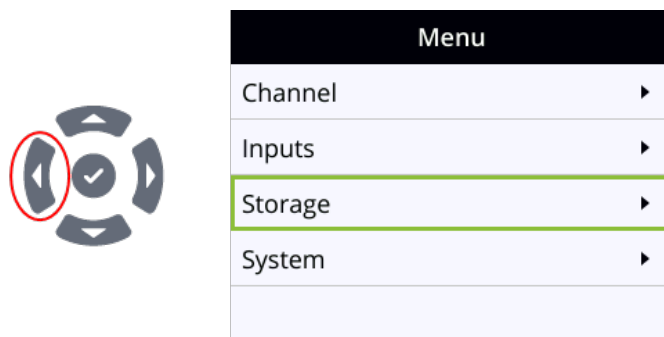
3 file(s) in the queue
Total size: 4.5 MB

	File Name	Start	End	Duration	File Size	
2020 Mar 03	My_Program_Mar03_11-24-46.mp4	11:24:46	11:25:02	16 seconds	1.2 MB	✘
	My_Program_Mar03_11-25-07.mp4	11:25:07	11:25:29	22 seconds	1.7 MB	✘
	My_Program_Mar03_11-25-33.mp4	11:25:33	11:25:52	19 seconds	1.5 MB	✘

Empty Queue

View File transfer status using the front screen menu

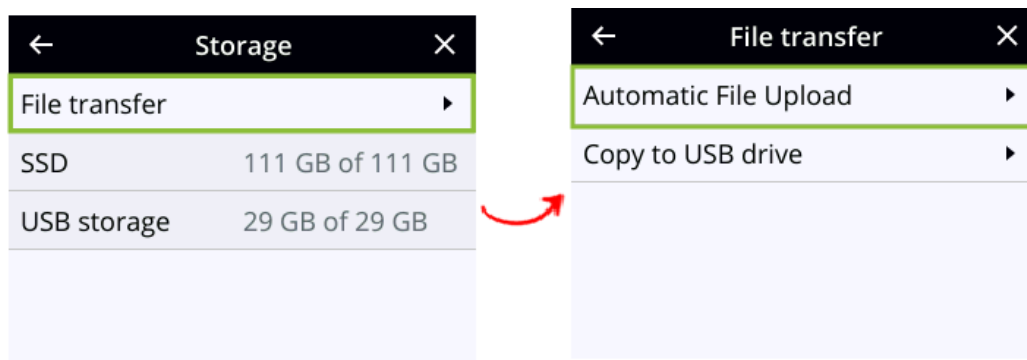
1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



Menu

- Channel ▶
- Inputs ▶
- Storage ▶
- System ▶

2. Use the arrow and check mark keys to select **Storage**. Then from the Storage screen, select **File transfer** to open the File transfer screen.



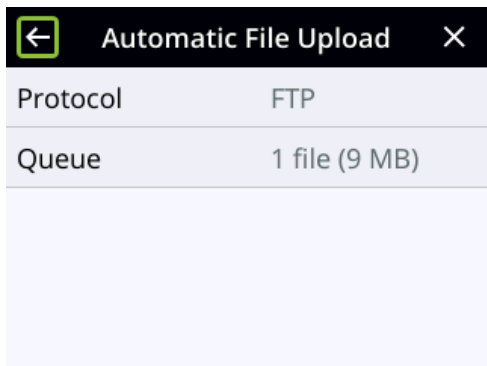
Storage

- File transfer ▶
- SSD 111 GB of 111 GB
- USB storage 29 GB of 29 GB

File transfer

- Automatic File Upload ▶
- Copy to USB drive ▶

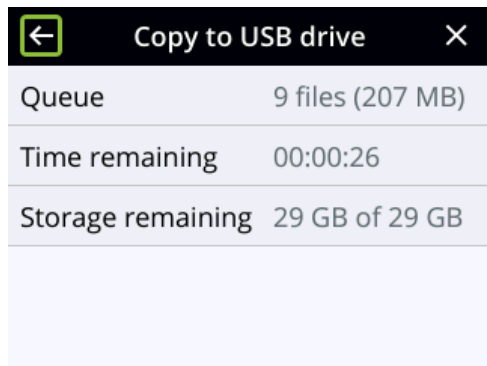
- 3. From the File transfer screen, do one of the following:
 - a. Use the arrow keys to highlight **Automatic File Upload** and press the **check mark** key to view the AFU progress.



The screenshot shows a screen titled "Automatic File Upload" with a back arrow on the left and a close 'X' on the right. The screen displays the following information:

Protocol	FTP
Queue	1 file (9 MB)

- b. Use the arrow keys to highlight **Copy to USB drive** and press the **check mark** key to view the Copy to USB drive progress.



The screenshot shows a screen titled "Copy to USB drive" with a back arrow on the left and a close 'X' on the right. The screen displays the following information:

Queue	9 files (207 MB)
Time remaining	00:00:26
Storage remaining	29 GB of 29 GB

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 this Pearl Nano resource. Click the page arrows at the bottom of each list to navigate through multiple pages.

Events

Last updated 07:13, 2019-10-08

Not logged in

Refresh schedule

Create new event

Ongoing and completed events

Event	Name	Type	Status
2018-11-15 14:00-14:57	Epiphan U Session 12	VOD	Recording 00:14:25 <input type="button" value="Stop"/>
2018-11-14 14:00-14:57	Epiphan U Session 11	VOD	Complete
2018-11-14 12:05-12:10	Nov 14 live event	Live-stream	Complete
2018-11-13 14:00-14:57	Epiphan U Session 10	VOD	Complete
2018-11-13 12:05-12:10	Nov 13 live event	Live-stream	Complete


Page 1 of 2

Scheduled events

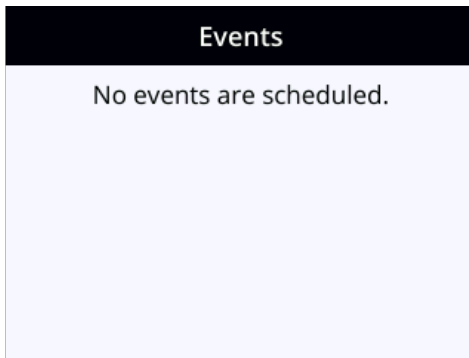
Event	Name	Type
2018-11-15 15:00-15:57	Epiphan U Session 13	VOD

Page 1 of 1

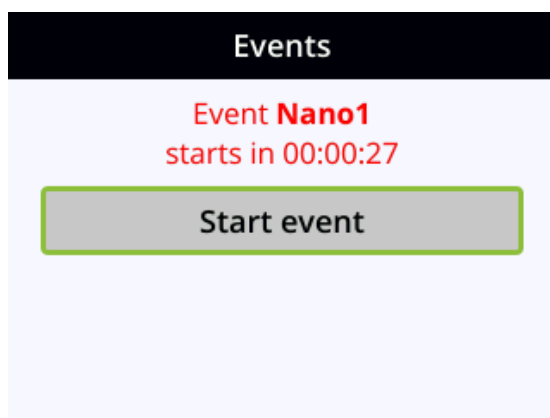
The Events page updates to show new events every hour. Click **Refresh schedule** at any time to manually update the Events page. The Events page only displays when Kaltura or Panopto CMS is enabled on Pearl Nano.

 If the time and zone settings of Pearl Nano 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 Nano to match the time and zone of Kaltura's scheduling server, see **Configure date and time**.

When CMS is enabled on Pearl Nano, an Events screen is added to the screens you can view on the front screen. If you don't see the Events screen on the front screen, press the **left arrow** key (or the right arrow key) on the control key interface to cycle through the different views.



When an event is scheduled, the Event screen updates with the event name and a countdown timer. Five minutes before the scheduled event, the event name and timer on the Events screen turn red.



PART 2: 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](#)
- [Channel configuration](#)
- [Custom layout configuration](#)
- [Video and audio input sources](#)



What is a channel?

Your video and audio sources that are connected to the input ports on Pearl Nano can be combined and added to a channel, which you can stream and record. A channel is essentially an encoding instance that you associate with your video and audio inputs to produce outputs such as video recordings and live streams.

Pearl Nano has a single channel already preconfigured as an Auto channel by default. As soon as you connect a video source to one of the video input ports, it appears automatically in the channel's custom layout.

Changing the channel's frame rate will change the frame rate used at the output port for that video input. For information about video inputs and signal priority when using Auto channels, see [About automatic channels](#)


Channel customization using the layout editor




There are many creative ways to customize a channel in Pearl Nano. Easily combine multiple video sources to the same layout for picture in picture or side-by-side layouts using the convenient custom layout editor. You can add text overlays and effects, like transparent logos and lower thirds. Customize a channel with images, company information, corporate colors, and time stamps just to name a few possibilities.


To create custom layouts, see [Custom layout configuration](#) and [About the custom layout editor](#).

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.

Layout example	Description
 <p>The screenshot shows a channel layout with a light green background. At the top left is the 'epiphany video' logo. The title 'Virtual Labs and Tutorials' is centered at the top. Below the title, there are two sections: 'Virtual Labs/Tutorials' with three bullet points, and 'Simple Integration with Web Conferencing Systems' with three bullet points. To the right of the text are two images: one showing lab equipment and another showing a person at a computer.</p>	<p>One video source (a slideshow presentation in this case), at the full size of the channel.</p> <p>To get this look: Using the custom layout editor, add one video source to the layout. Make sure the channel encoding is set to use the current signal resolution or manually set the channel encoding frame size to match the current video.</p>

Layout example	Description
	<p>One video source with a logo (.png with transparency) in the bottom left corner.</p> <p>To get this look: Upload an image with transparency. Using the custom layout editor, add one video source to the layout and allow the channel to automatically use the current signal resolution. Then, add the image to the layout and drag it where you want it to appear on screen.</p>
	<p>One source with a text overlay in the bottom right corner.</p> <p>To get this look: Using the custom layout editor, add one video source to the layout and allow the channel to automatically use the current signal resolution. Then, add a text overlay to the layout and drag it where you want it to appear on screen.</p>
	<p>One video source (a slideshow presentation in this case), with a green background matte.</p> <p>To get this look: Using the custom layout editor, select a background color and add your video source to the layout. On the Channel Encoding configuration page, manually set the channel's encoding frame size to 1920 x 1080. Then, go to the HDMI input's configuration page and set the Scaling value of the HDMI input to a smaller value, making sure you maintain the same aspect ratio (i.e. 1360x738). Back on the layout editor, drag to reposition your now smaller video source.</p>

Layout example	Description
	<p>Two video sources (a slideshow and a presenter cropped to a new aspect ratio Crop a video source), a background image, and a logo. Make sure the background image has the correct aspect ratio and fills the channel (i.e. 1920×1080).</p> <p>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. On the Channel Encoding configuration page, manually set the channel's encoding frame size to 1920×1080.</p> <p>Then, go to configuration page for the HDMI video input with the slideshow and set the Scaling value, making sure you maintain the same aspect ratio (i.e. 1360×738). Back on the layout editor, add the logo to the layout and move it into position. For the second video source, use the Crop tool to crop the second source to a square aspect ratio and drag it into position.</p>

About automatic channels

To get you started as quickly as possible, Pearl Nano comes pre-configured with an automatic channel called Auto. Simply plug a source into one of the video inputs and Pearl Nano 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 front screen or using a web browser on the same local network as . Browse to the following URL:

```
http://<serial>.local/preview.cgi?channel=1
```

For example: `http://d560515f.local/preview.cgi?channel=1`

If Bonjour services, which permits browsing by serial number, are not installed on your admin computer, you can get the IP address of Pearl Nano from the front screen System status screen and browse to:

```
http://<IP Address for Pearl Nano>/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.
- If you modify the automatic channel's video input source manually using the custom layout editor, the channel no longer functions as an automatic channel and the channel name changes to the name of the video source. To revert a channel back to an automatic channel, add **Auto** as the sole video source for the channel using the custom layout editor and delete the current channel name. When you press **Enter** using your keyboard to save the blank channel name, the channel reverts to the default automatic channel. Alternatively, you could perform a factory reset or apply the default configuration preset to restore the automatic channel; however, other important system settings and configurations will also revert to their default settings.

Which signal does the auto channel use?

Pearl Nano 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 while Pearl Nano is powered on, the first source you attach has the highest priority. If you attach more than one source before powering on, the following priority is used:

Priority	Connector Type
1	HDMI (with HDMI Audio)
	SDI (with SDI Audio)

The auto channel uses a source until that source no longer has a signal. Then, it switches to the next highest priority signal.

If all the connected sources lose signal at the same time (i.e. for example, if 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.



Channel encoding settings may be automatically overwritten when using Pearl Nano with a Content Management System, see **About Panopto recording and webcasting**

Topics include:

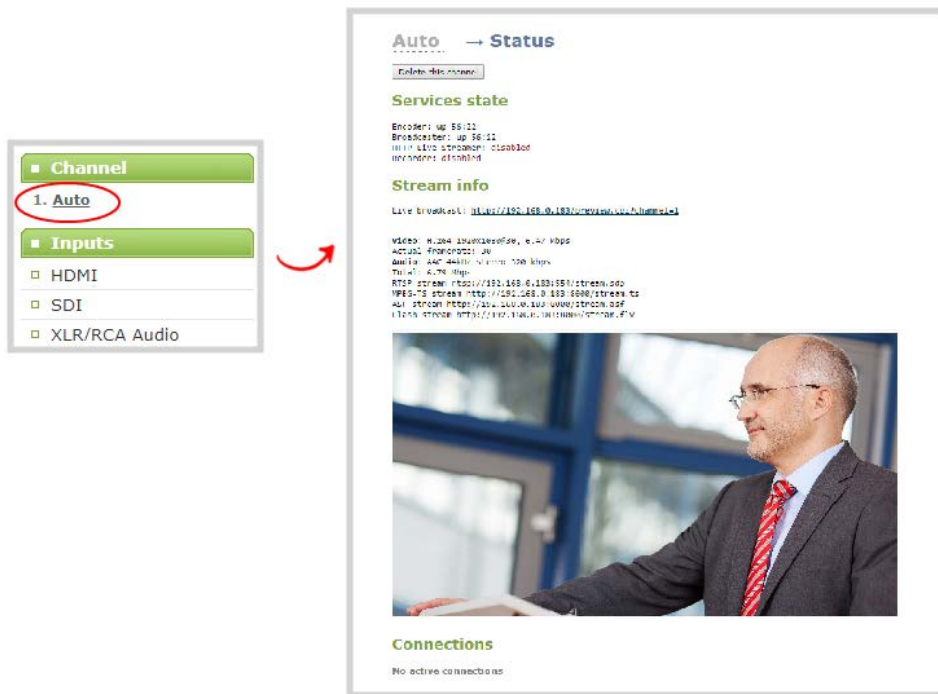
- [Configure an auto channel](#)
- [Add video sources](#)
- [Add an audio source to a layout](#)
- [Rename a channel](#)
- [Preview a channel](#)
- [Add or remove channel metadata](#)
- [Configure encoding](#)
- [Codecs and file format compatibility](#)
- [Configure video encoding](#)
- [Configure audio encoding](#)

Configure an auto channel

An Auto channel is included with Pearl Nano 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 Admin panel](#).
3. From the Channel menu, click **Auto**. 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**. 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**.

Add video sources

You can add up to two video sources to the custom layout for your channel using the custom layout editor.



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, see **Configure encoding**.

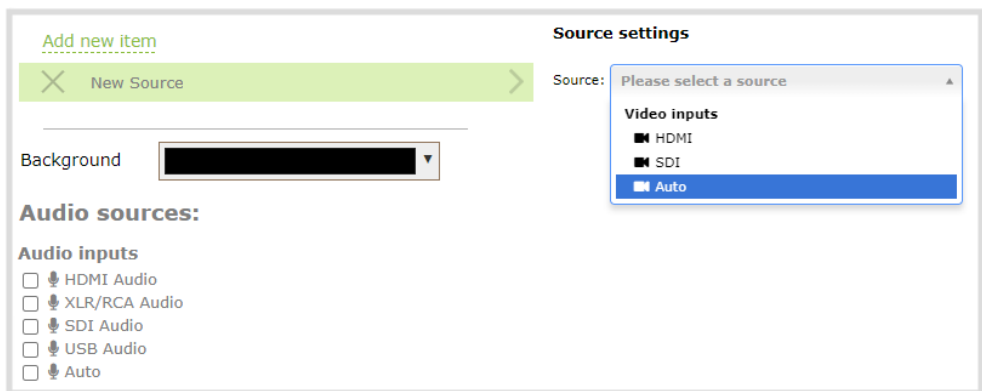
Add a video source using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).

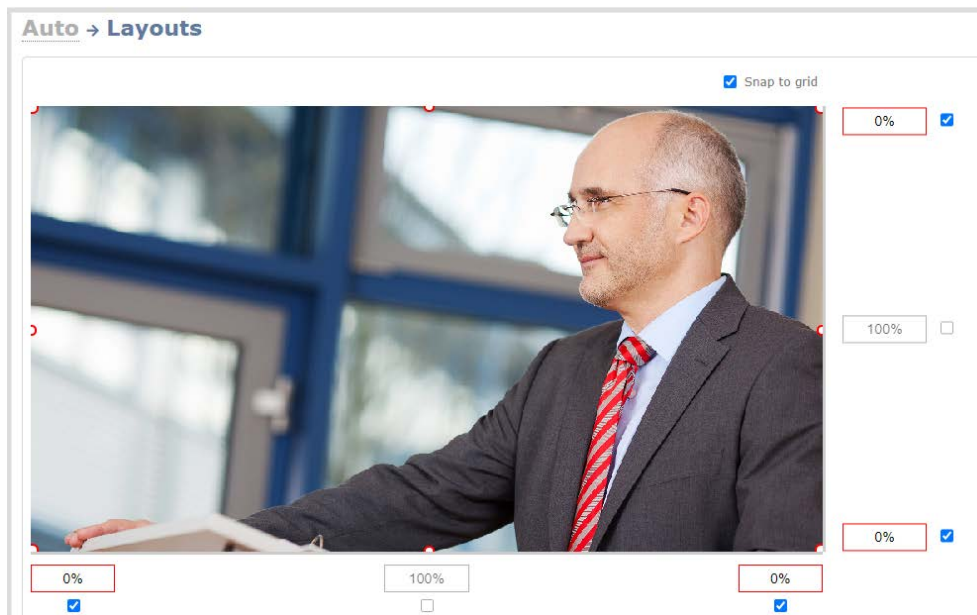
2. From the Channel menu, select the channel and click **Layouts**. The custom layout editor opens.
3. Below the Layout editing area, click **Add new item** and select **Video Source**. The Source settings appear.



4. Under Source settings, select either a video input or a channel in the **Source** drop-down menu.
5. Under Source settings, select a video input in the **Source** drop-down menu.



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.

6. 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.

7. Click **Save**.

To layer multiple video sources for picture in picture or add other items like logos and images, 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. However, to scale a video source to appear smaller than the full frame size, you must manually change the encoding of the video input and scale the image smaller. For examples of how to get creative with the layout editor, see [Channel layout examples](#).

A note about item positioning and sizing

There are multiple ways to position and size images and text overlays in the layout area

1. Using the mouse.
2. Using the keyboard.

3. Using the manual positioning values with percents.
4. Using the manual positioning values with pixels.

To use the mouse:

Click and drag to move the item. Click and drag the round, red and white handles to resize an image (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.

To use 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, 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.

Important considerations

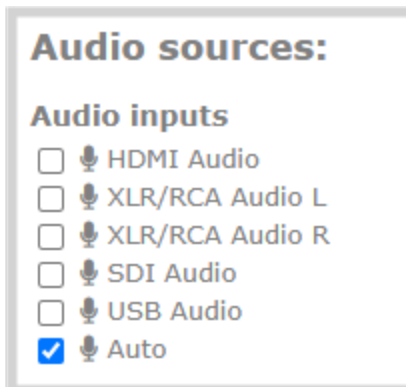
- For SRT and RTSP input sources, there's no need to manually add the audio sources separately to your channel. When the network stream is connected to your Pearl Nano as an input source, a corresponding audio source is automatically added to the list of audio sources for your channels, even if there is no audio in the stream.



- The XLR 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 Pearl Nano, 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 Admin panel](#).
2. From the Channel 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](#).

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 initially have the channel name Auto. 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, Pearl Nano will automatically repopulate the name field with the default name.

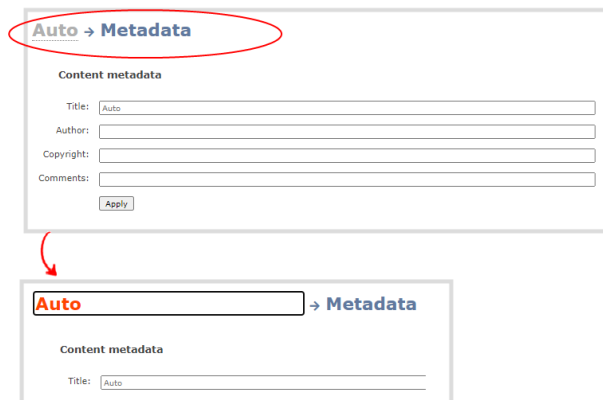
You can include certain international characters in channel names. Pearl Nano supports common character sets for Western and Central European languages, Nordic languages, and Russian. Channel names should not include special characters, slashes, or spaces. For a complete list, see [International character support](#).



Do not include any special currency, mathematical symbols, and other special characters such as slashes or spaces in the channel name. Pearl Nano replaces special characters with an underscore.

Rename a channel using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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.

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

Important considerations

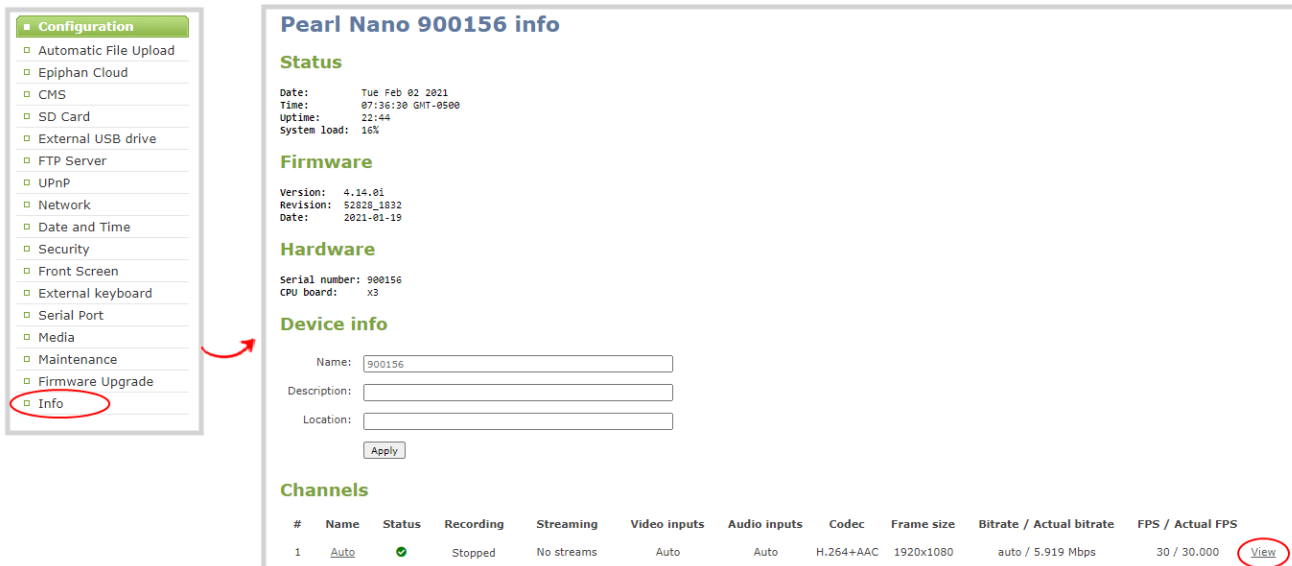
- Some web browsers disable auto playback of videos with audio. In those cases, the audio for the channel being previewed is muted by default.
- HTML5 does not support PCM audio encoding. If PCM audio encoding is configured for a channel, audio does not play in the preview link for the channel.
- PCM 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 Nano, the live broadcast URL will start with *https* instead of *http*.

Preview a channel from the Info page using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).



- 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 Nano.



This feature is not available using the local console on Pearl Nano.

- Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
- From the Channel menu, select the channel and click **Status**. The Status page opens and a live preview snapshot appears below the Stream info.
- Right-click the **Live Broadcast** link and select **Open in a new Tab** or **Open in a new Window**.


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:



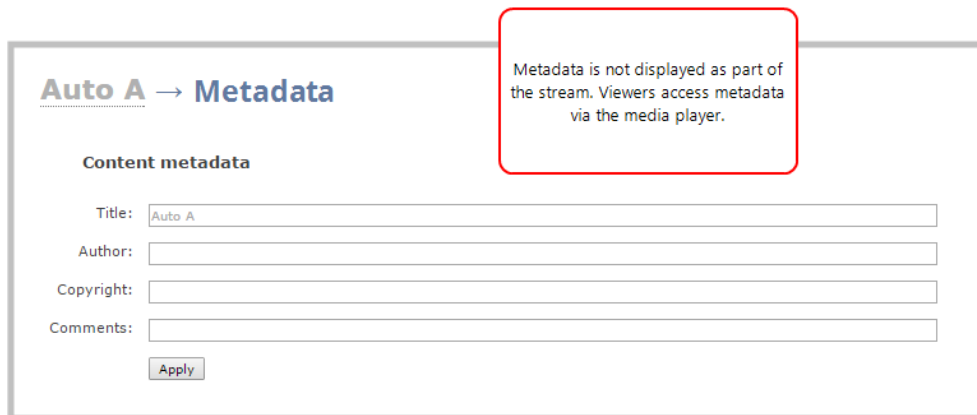
- title of the presentation
- Author
- copyright date or other labels such as proprietary information, preliminary etc.
- additional comments about the broadcast, such as time of the broadcast, or change to the schedule

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 Nano 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 Admin panel](#).
2. From the Channel 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**.



Auto A → Metadata

Content metadata

Title:

Author:

Copyright:

Comments:

Metadata is not displayed as part of the stream. Viewers access metadata via the media player.

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 Pearl Nano with a Content Management System, see **About Panopto recording and webcasting**

Topics include:



- [Codecs and file format compatibility](#)
- [Configure video encoding](#)
- [Configure audio encoding](#)

Codecs and file format compatibility

Pearl Nano uses the H.264 video codec, which provides high quality video while using low bandwidth.

Table 34 Supported audio codecs and bitrate guidance

Value	Description
AAC	<p>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.</p> <p>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.</p> <p>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.</p>
MP3	<p>MP3 provides a common audio format for audio storage. Supported sampling bitrate values are: 22 kHz, 44 kHz and 48 kHz.</p> <p>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.</p>

Value	Description
	 <p>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.</p>
PCM	<p>Pulse Code Modulation (PCM) is a standard for digital audio in computer and other devices such as, digital telephone systems.</p> <p>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.</p>  <p>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 (FLV) do not support 48 kHz PCM audio.</p>

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 Nano.

Table 35 Video/audio codecs and formats for streaming

Video Codec selected	Audio Codec selected	RTSP	FLV	MPEG-TS	MJPEG
H.264	No audio codec	✓	✓	✓	
H.264	PCM	✓	✓		
H.264	MP3	✓	✓	✓	
H.264	AAC	✓	✓	✓	

The following table displays the compatibility between the video/audio codecs and the supported recording formats.

Table 36 Video/audio codecs and formats for recording

Video Codec selected	Audio Codec selected	MP4 and MP4-Fragmented	AVI	MOV	MPEG-TS
H.264	No audio codec	✓	✓	✓	✓
H.264	PCM	✓	✓	✓	
H.264	MP3	✓	✓	✓	✓
H.264	AAC	✓	✓	✓	✓

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. Options are H.264 (default) and Motion JPEG.
- **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:** If using the H.264 video codec, you can 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.



By default, Pearl Nano 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 CPU performance](#).
- 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 Nano 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 Nano downscales the video and streams/records the channel at the lower frame size, using less bandwidth and producing smaller recorded files.

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 Nano 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 37 Video encoding settings

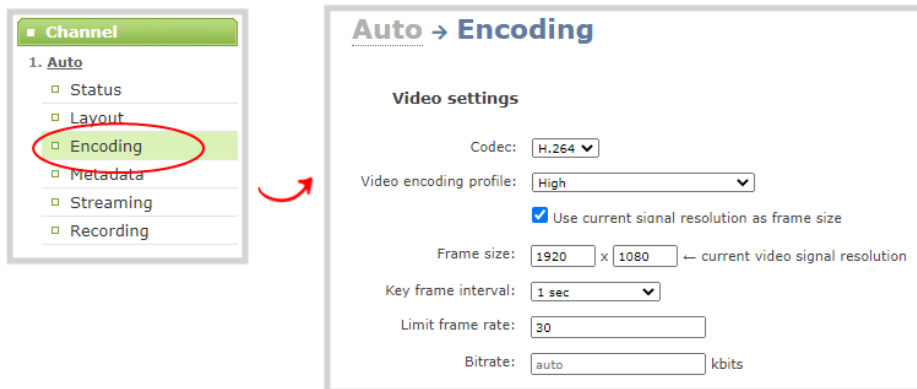
Setting	Description
H.264	H.264 is the default codec and provides high quality video while using low bandwidth. This is the preferred codec for the system.
Key frame interval	<p>The key frame interval feature specifies how often a key frame (a frame that contains all the pixels) is sent when streaming 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.</p> <p>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</p>



Setting	Description
	<p>to 3 seconds and decrease the key frame interval as the motion increases. 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.</p>
<p>Frame rate</p>	<p>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.</p> <p>The system's ability to maintain a set frame rate is based on several factors, for example:</p> <ul style="list-style-type: none"> • 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. <p>When adjusting the frame rate, you may need to try different values to achieve the best outcome.</p>
<p>Bitrate</p>	<p>In general, higher bitrates mean higher image quality, but more bandwidth is needed for streaming and video recordings are larger. If you're using H.264, then you can set the bitrate to improve the image quality.</p> <p>For example, an HD Blu-ray video is typically in the range of 20 Mbps, whereas a standard-definition DVD is usually 6 Mbps.</p> <p>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.</p>

Configure video encoding for a channel using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
1. From the Channel menu, select the channel and click **Encoding**. The encoding configuration page opens.




2. Select **H.264** and then select a **Video encoding profile**.

Item	Options
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.

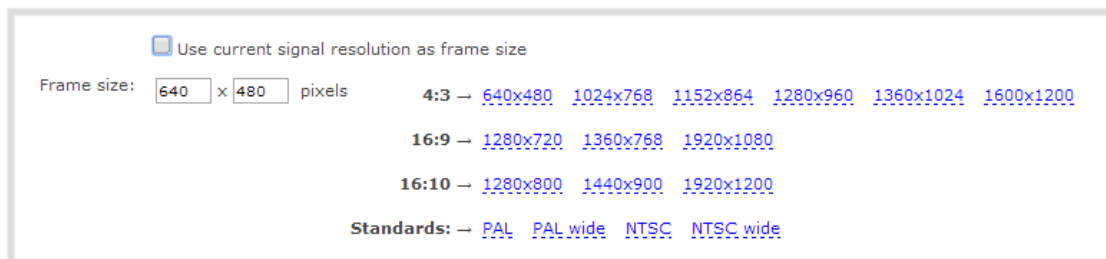
3. Configure the frame size, do the following:

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.





4. 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
5. Change the **Bitrate**. If using H.264 video codec, 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.
6. 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.

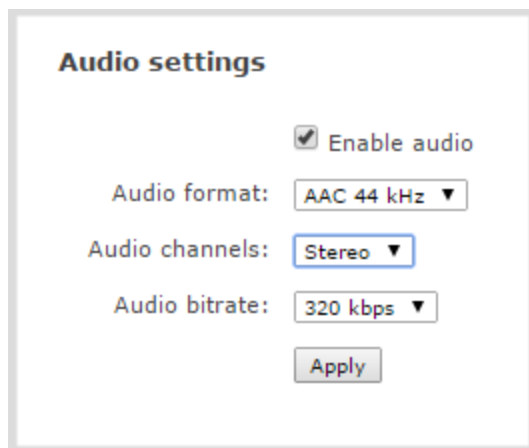
Table 38 Supported Audio codecs and bitrates

Value	Description
AAC	<p>The AAC (default) audio codec is comparable to MP3 and may produce better sound quality with a similar bitrate. Supported values are 16, 22, 44 and 48K kHz.</p> <p>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.</p> <p>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.</p>
MP3	<p>MP3 provides a common audio format for audio storage. Supported values are 22 kHz, 44 kHz and 48 kHz.</p>

Value	Description
	<p>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.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;">  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. </div>
PCM	<p>Pulse Code Modulation (PCM) is a standard for digital audio in computer and other devices such as, digital telephone systems.</p> <p>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.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;">  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. </div>

Change the audio codec for a channel using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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 (AAC, MP3, or PCM).
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 XLR/RCA 1 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.)

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**.

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](#)
- [Set the background color](#)
- [Add an image to a layout](#)
- [Upload or remove an image using the Media page](#)
- [Add a text overlay](#)
- [Custom system variables for text overlays](#)
- [Crop a video source](#)

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**.

Layout editing

The layout editing area is where you can add images, add video sources, and add text overlays to your layout. You can also choose a background matte color, as well as crop images and video.



 You cannot use the custom layout editor to resize video inputs on Pearl Nano. Use the scaling option on the video inputs configuration page instead, see **Configure a video input source**.

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 images and text overlays 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** images and text overlays 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.

To resize a video source so that it appears smaller within the frame, like for a picture in picture layout, you can change the scale from the video input's configuration page, see [Configure a video input source](#). You can crop a video source smaller using the custom layout editor. For examples, see [Channel layout examples](#). After a video source is resized smaller than the frame size of the channel, you can simply click and drag the video source into position.

A note about item positioning and sizing

There are multiple ways to position and size images and text overlays in the layout area

1. Using the mouse.
2. Using the keyboard.
3. Using the manual positioning values with percents.
4. Using the manual positioning values with pixels.

To use the mouse:

Click and drag to move the item. Click and drag the round, red and white handles to resize an image (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.

To use 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, 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:

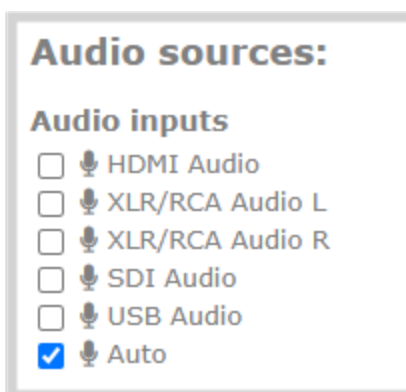
Specify a whole number, followed by a percent sign (e.g. 4%) in any of the manual positioning fields. See [Resize and position items using percents or pixels](#) for more information.

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.




If an Auto channel is selected as a video source, then Auto A 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 (images and text overlays) 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](#).

 You cannot use the custom layout editor to resize video inputs on Pearl Nano. Use the scaling option on the video inputs configuration page instead, see **Configure a video input source**.

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).

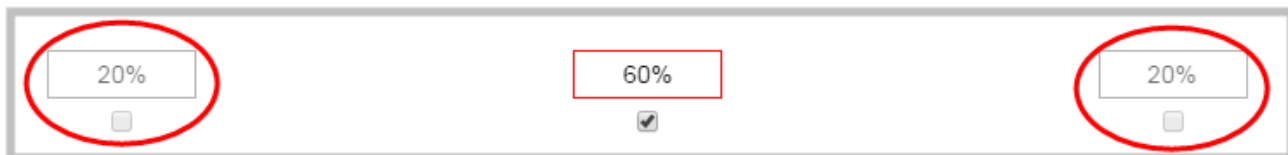


Percent values are used in adjustment boxes by default, and can be converted to pixels by simply overwriting the percent value in a given adjustment box and replacing it with a pixel value.

 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 39 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. (I.e. 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 . (I.e. 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 (i.e. frame size) identified in your channel's encoding settings Configure encoding .
4	The percentage of blank space (or number of pixels) from right to left on the layout's horizontal axis. (I.e. 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

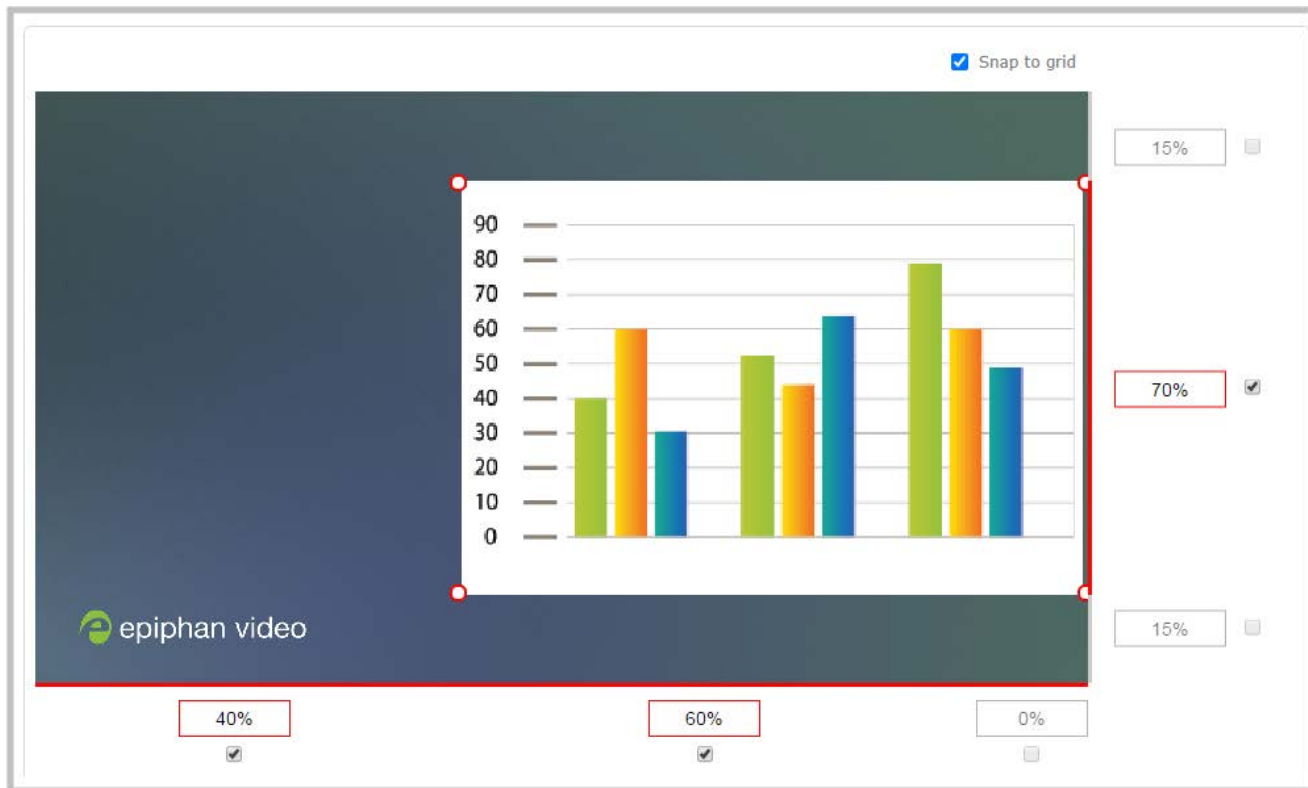
Item	Description
	horizontal axis. (I.e. the item is displaced 10%, or 100px, from the bottom up).
6	<p>If using percents, this is the items percentage of total height on the layout's vertical axis. (I.e. the item takes up 80% of the layout's height – represented by a thin red bar to the left of the percent box).</p> <p>If using pixels, this value is the item's height, in pixels, with a maximum pixel width (i.e. frame size) identified in your channel's encoding settings Configure encoding.</p>
7	The percentage of blank space (or number of pixels) from the top downward on the layout's vertical axis. (I.e. 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](#).



You cannot use the custom layout editor to resize video inputs on Pearl Nano. Use the scaling option on the video inputs configuration page instead, see **Configure a video input source**.



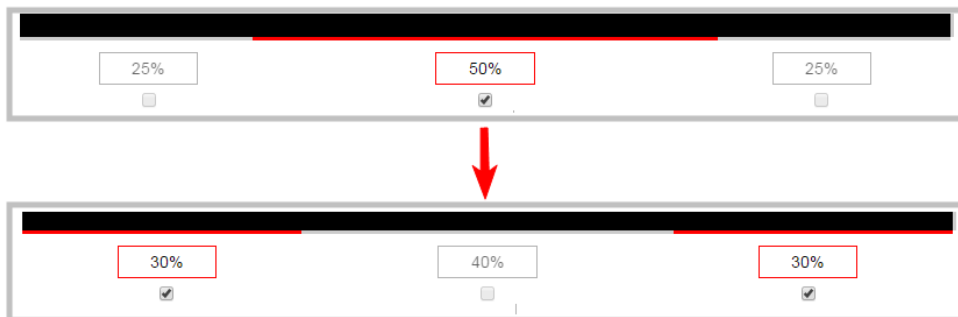
In the example, the slideshow video source is resized to 60% of the layout's width and 70% of the layout's height (with aspect ratio maintained). (Alternatively, pixels could be used to resize the layout item in a similar fashion.)

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.



To resize a video source so that it appears smaller within the frame, like for a picture in picture layout, you can change the scale from the video input's configuration page. You can also crop a video source smaller. For examples, see [Channel layout examples](#). After a video source is resized smaller than the frame size of the channel, you can simply click and drag the video source into position or use any of the other methods described.

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.

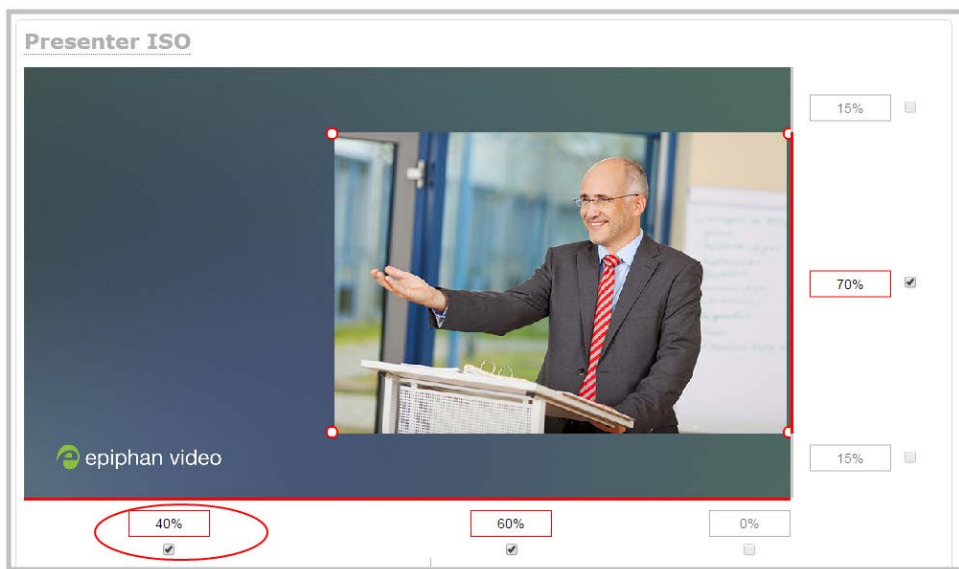
You can only reposition a video source within the frame using the layout editor if the video source has been cropped smaller than the actual frame size that is set for the channel, or if the video input source has been scaled smaller than the frame size that is set for the channel. For examples, see [Channel layout examples](#).

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).

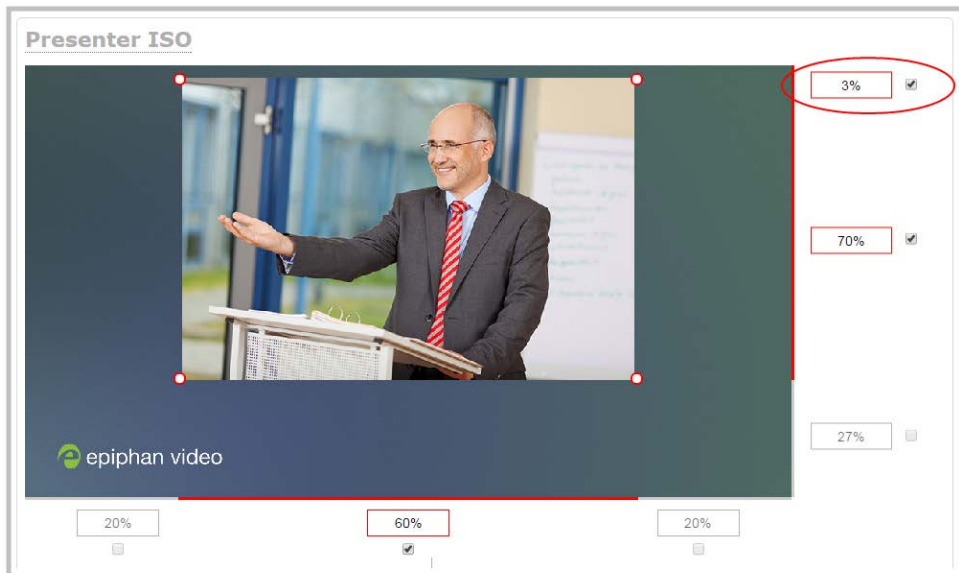


The right adjustment box automatically sets itself to 0% to reflect that there is no more room remaining to maneuver the image along the horizontal axis any further. Alternatively, you could reposition the image in the exact same way by instead setting the right percent box to 0%.

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.)



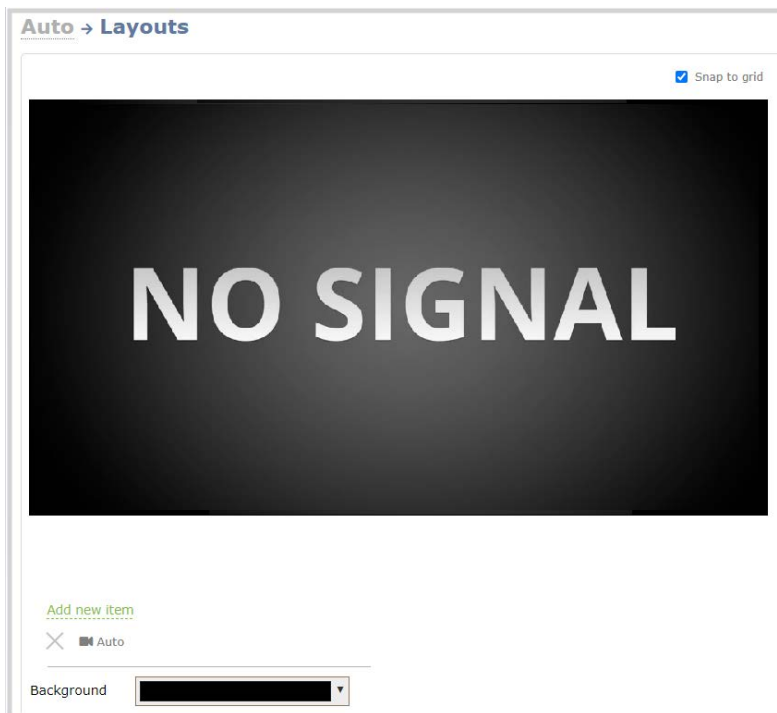
You can manipulate elements to get the custom look that you want using percents, pixels, your keyboard, or any combination. Here's an example of using pixels and percents to created a custom layout with two video sources and a background image. The slideshow video source is scaled and the presenter's 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 Admin panel](#).

- From the Channel menu, select the channel and click **Layout**. The custom layout editor opens.
If no video source is connected and the layout is unformatted, the layout area is empty

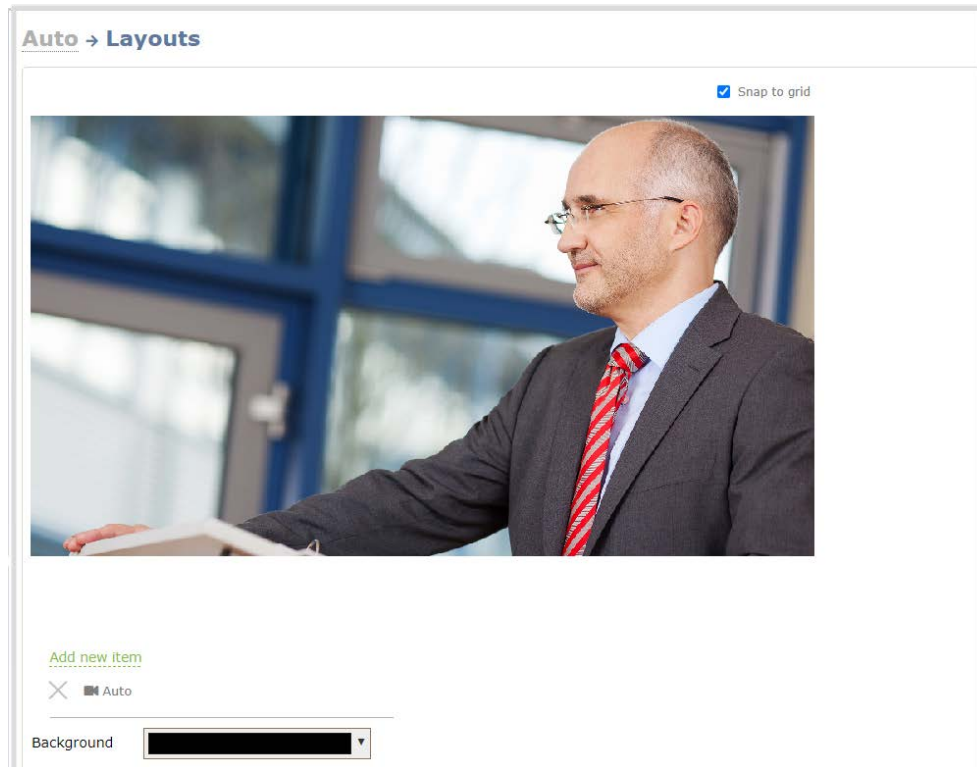


Configure a custom layout for a channel

Pearl Nano is a single channel encoder that gives you the flexibility to customize the layout. You can add images, text overlays, and custom backgrounds. Using the custom layout editor, you can also do things like add multiple audio sources, crop and reposition video sources that are scaled smaller than the channel's frame size. For examples of how to get different channel layouts, see [Channel layout examples](#)

Configure a custom layout for a channel using the Admin panel


- Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
- From the Channel menu, select a channel and click **Layout**. The custom layout editor page opens. If this is an Auto channel and you have a video source connected to Pearl Nano and the channel encoding is set to use the current signal resolution as frame size, the video source automatically appears in the full frame. Otherwise, a No Signal image appears.



3. Add another item to the layout, like an image. See [Add an image to a layout](#) for instructions to add an image to a layout.
4. Click and drag the red and white handles on the corners of the image to re-size it in the layout editor area.



- 5. Click **Save** when you're done or continue to add additional images or video sources to the layout. You can resize and crop a video source to exactly how you want it to appear. For examples, see [Channel layout examples](#).

 You cannot use the custom layout editor to resize video inputs on Pearl Nano. Use the scaling option on the video inputs configuration page instead, see **Configure a video input source**.

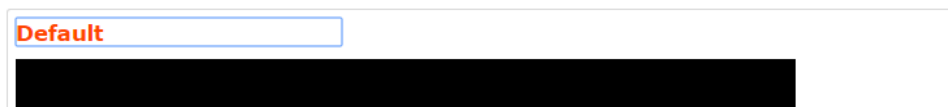
Rename a layout

You can rename a layout using the custom layout editor.

You can include certain international characters in layout names. Pearl Nano supports common character sets for Western and Central European languages, Nordic languages, and Russian. 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 Admin panel](#).
2. From the Channel menu, select the channel and click **Layout**. The custom layout editor opens.
3. Click the name of the layout so that the name turns red. Type a new name and then press the **Enter** key.

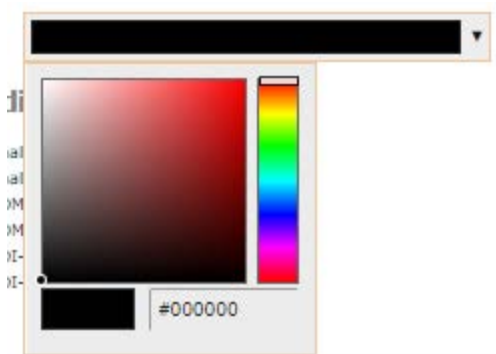


Set the background color

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 Admin panel](#).
2. From the Channel menu, select the channel and click **Layout**. 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 Nano supports png (PNG) and .jpg (JPEG) images. You can upload images that are 16×16 pixels to a maximum image size of 4096×4096; however it's strongly recommended that you upload exactly the size you need to avoid image scaling.

Images can be uploaded in advance from the Media page, see [Upload or remove an image 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 3840×4096.


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 Admin panel](#).
2. From the Channel menu, select the channel and click **Layout**. The custom layout editor opens.
3. Click **Add new item** and choose **Picture** from the drop down. The picture settings appears.

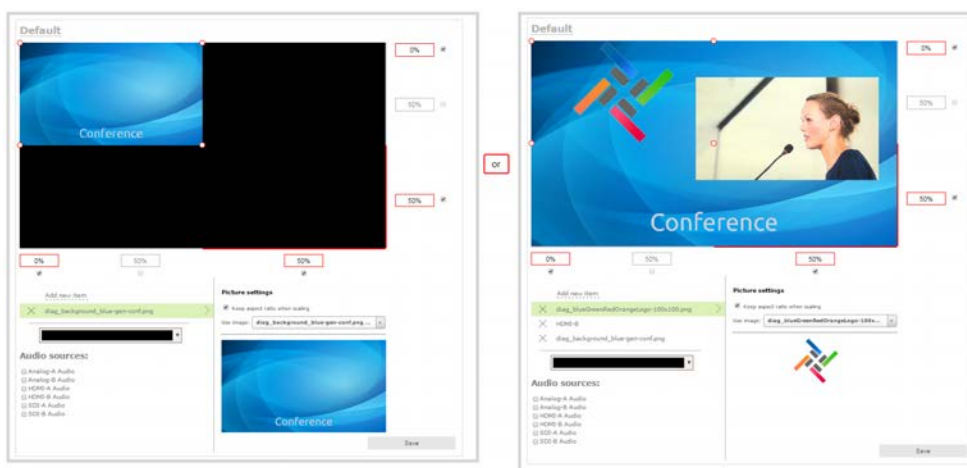


4. Select an image from the **Use picture** drop-down menu. To upload the image, drag and drop it from your desktop to the gray **Please select picture** area. For best results, keep the **Keep aspect ratio when scaling** check box selected (default).

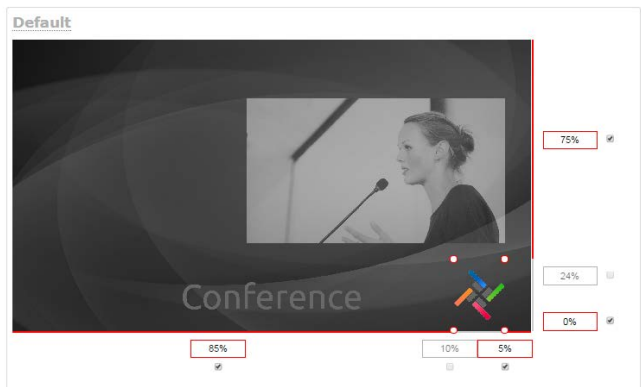


 For best results, check **Keep aspect ratio when scaling** in the **Source settings**.


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.

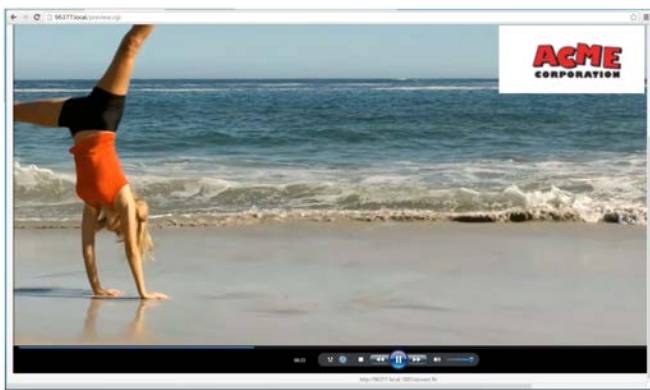
 To layer items over top of each other, like for background images or a transparent logo, you can click and drag elements that appear in the item list beneath **Add new item** and change their order. Items that are higher up the list appear over top items that are lower down the list.

8. Click **Save**.

Upload or remove an image using the Media page

You can customize a channel by adding pictures as backgrounds, overlays, or transparent overlays. Image files formats supported include: PNG and JPEG.

The maximum supported image size is 3840×2160. 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).

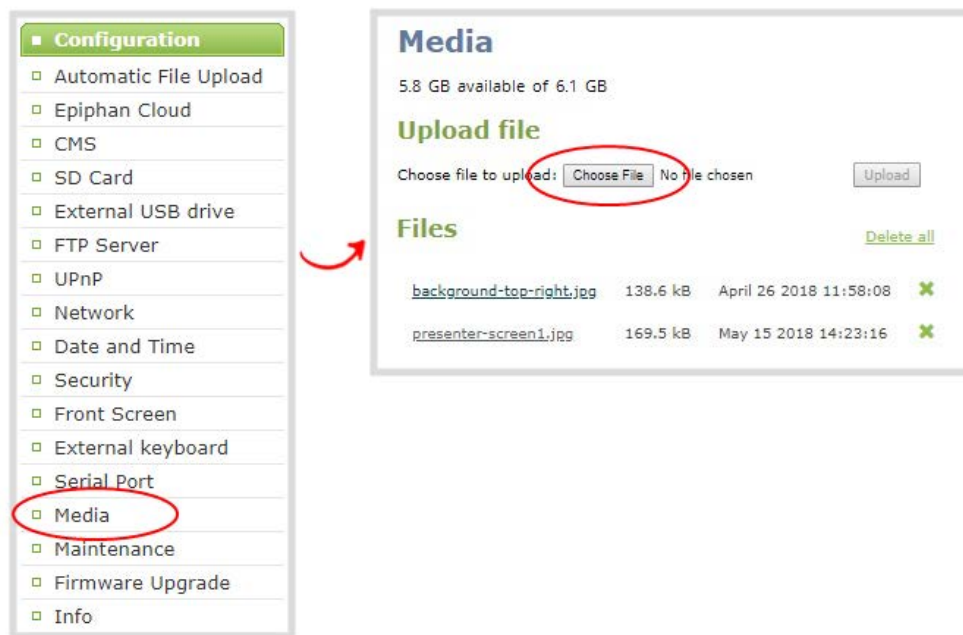
There are two ways to upload images. You can upload images from the Media page using the Admin panel or drag and drop your image into a layout using the custom layout editor, see [Add an image to a layout](#).

Important considerations

- Media file names should not include special characters, slashes, or spaces.
- 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. Login to the Admin panel as **admin**, see [Connect to 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 40 *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
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

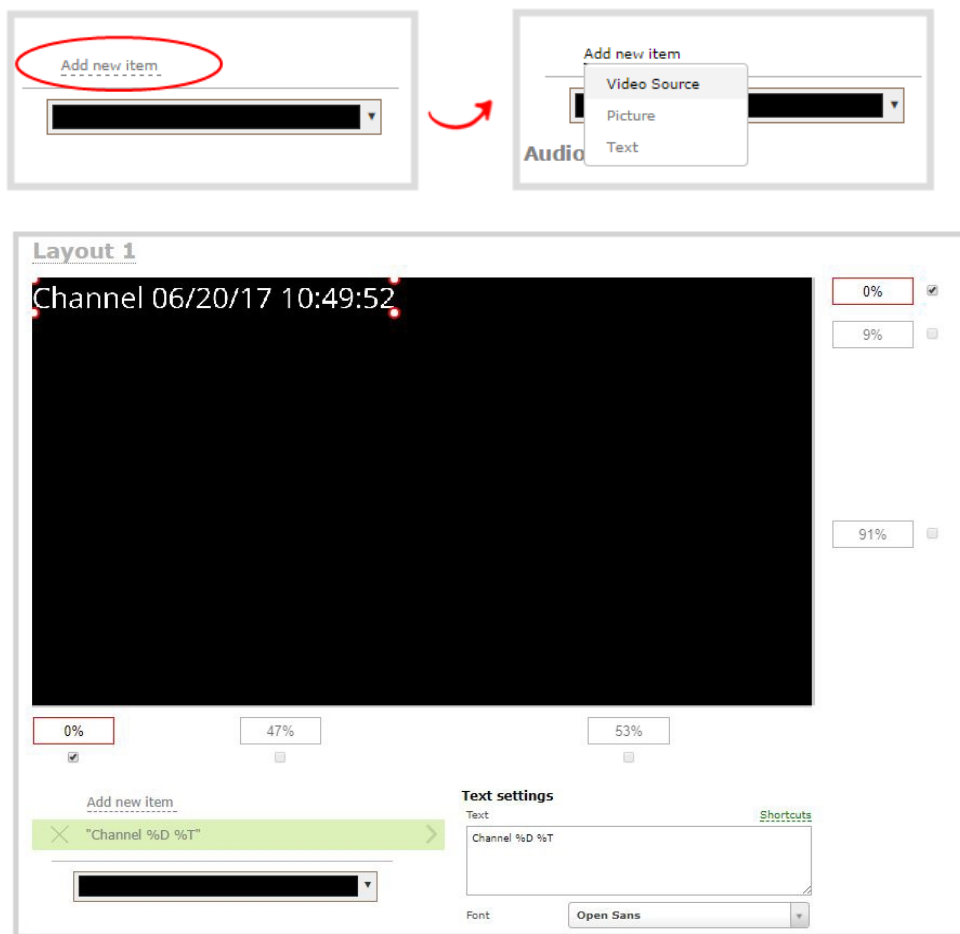


If you use a non-monospaced font, the size of the text overlay changes as the letters, numbers, and the length of words change. Use a monospaced font to maintain a consistent size for the text overlay (assuming the total number of characters in the text string doesn't change).


You can include certain international characters in text overlays. Pearl Nano supports common character sets for Western and Central European languages, Nordic languages, and Russian. 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 Admin panel](#).
2. From the Channel menu, select the channel and click **Layout**. 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 Auto A.
```

The resulting text is displayed:

Friday June 23, 2017. Live streaming channel Auto A.

- 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.

Text settings [Shortcuts](#)

Text: Channel %D %T

Font: Open Sans

Font size: 72 px

Line spacing: 150%

Text color: [white]

Background:

Background color: [black]

Padding-top: 0 px


Padding-right: 0 px

Padding-bottom: 0 px

Padding-left: 0 px

Save

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**.

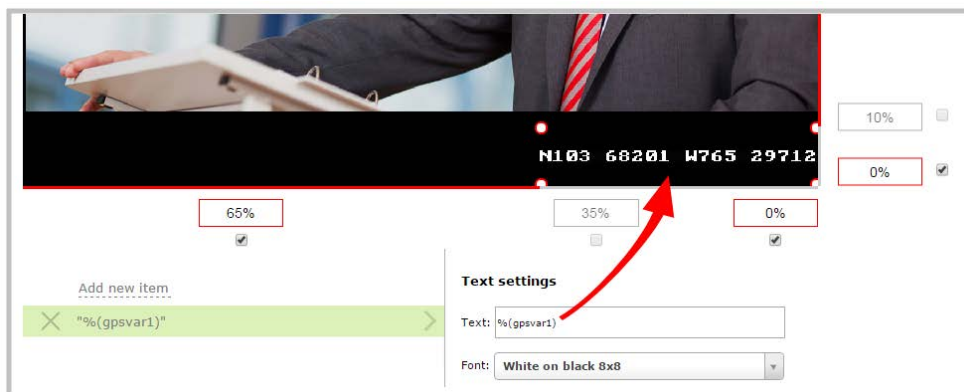
Custom system variables for text overlays

Using HTTP or RS-232 APIs, you can create your own custom system variables for use in text overlays. 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 depending on the characters in the content and the number of characters. To maintain a consistent size for the text overlay in the layout area, use a monospaced font and make sure the number of characters 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 and are deleted when the system reboots.

To learn more about global variable command syntax and important considerations when using them, see the [Pearl System API Guide](#) for details.

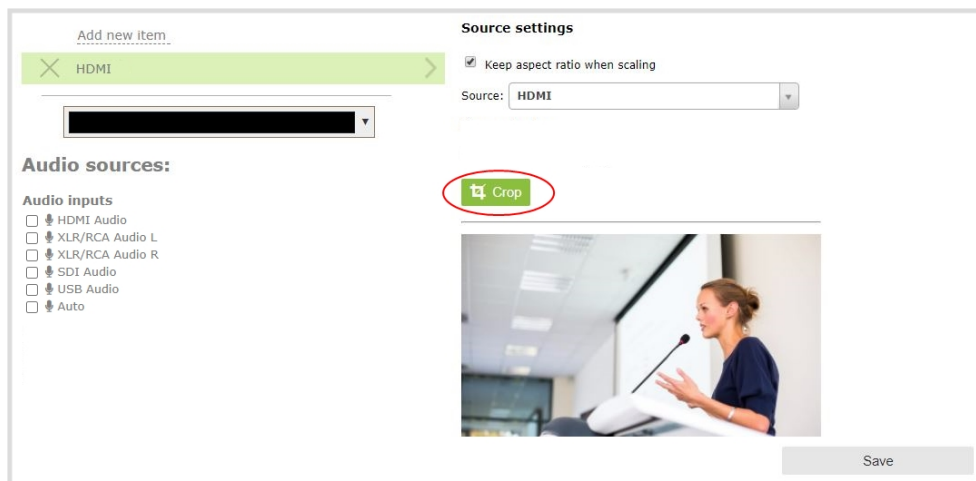
For more information about sizing and positioning elements in the custom layout editor area, see [About the custom layout editor](#).

Crop a video source

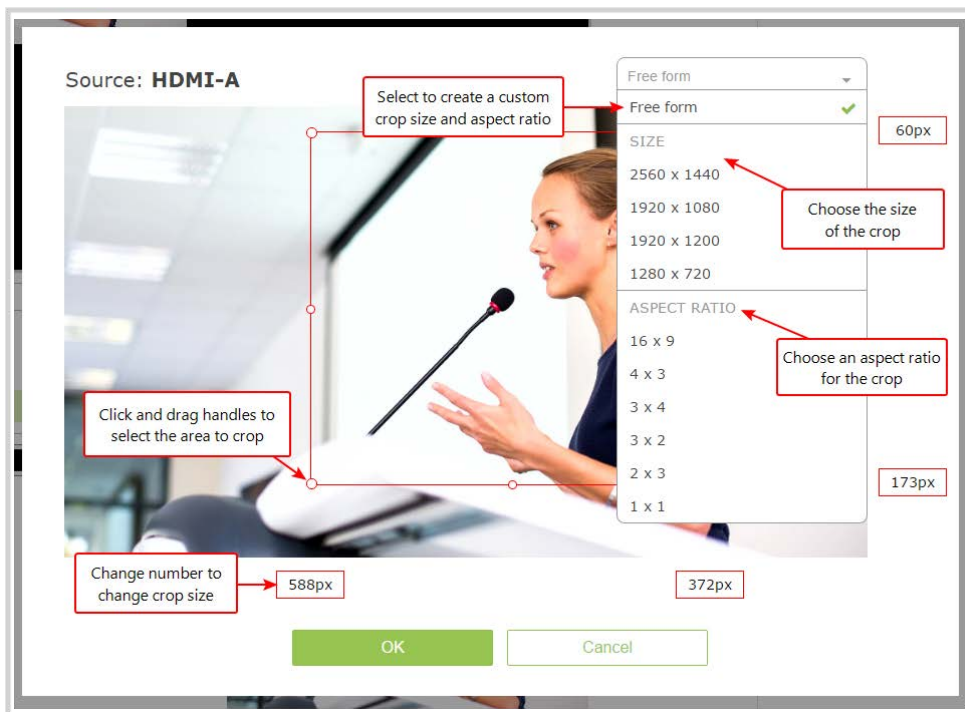
You can crop a video source to change the size and shape of your video as it appears on screen using the custom layout editor. Cropping a source gives you a lot of advantages and can help to conserve the overall amount of processing CPU usage for your Pearl Nano.

Crop a source using the Admin panel's custom layout editor

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select the channel and click **Layout**. 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.



Video and audio input sources

The Admin panel automatically discovers all video and audio sources that you connect to the input ports on Pearl Nano 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 RTSP and 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 Pearl Nano, and even another Pearl Nano device.

Topics include:

- [About connecting video and audio sources](#)
- [Tested RTSP-based IP cameras](#)
- [Connect an RTSP source](#)
- [Connect an SRT stream as an input](#)
- [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 Pearl Nano 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 Pearl Nano must both be powered on to make the connection.

Connect your video and audio sources to the following input ports on your system:

Table 41 Cable and port connections

Source type	Input port
SDI	SDI port
HDMI (HDCP-protected) or DVI	HDMI port

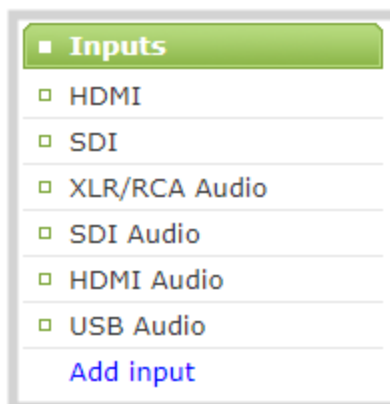
Source type	Input port
(adapter)	
USB audio (UAC)	USB 3.0 port (rear)
Ethernet	RJ-45 port. SRT and RTSP are digital sources you connect to your Pearl Nano via the Ethernet network port.
Audio	Audio input port: XLR or RCA



Application of amplified speaker signals to the audio line inputs exceeds the recommended ratings and may permanently damage the device.

Changing the video or audio source that is streamed or recorded 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 be disconnected and need to re-connect to the stream.

The Admin panel automatically discovers all video and audio sources that you connect to the input ports on Pearl Nano and lists them in the Inputs menu of the Admin panel. Sources coming from the Ethernet network such as SRT 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 Nano or create your own custom no signal image. See [Add a custom No Signal image](#).

Audio mixers and other line level devices can be connected to the XLR and RCA audio input ports on Pearl Nano. Embedded audio from sources connected to the HDMI and SDI ports is also supported. Pearl Nano also supports connection of USB audio (UAC) devices. For specifications and guidance when connecting an audio source, see [Tech specs](#) and [Selecting an audio source](#).

Tested RTSP-based IP cameras

Pearl Nano is 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 Nano. 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 Pearl Nano, 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 42 List of tested IP cameras

Brand	Model	Image	URL syntax	Audio?	Default username and password
Q-See	QCN8029Z		/	No	admin admin

Brand	Model	Image	URL syntax	Audio?	Default username and password
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
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 Nano.


Connect an RTSP source

You can connect a single RTSP source such as an IP camera or another Pearl Nano system to your Pearl Nano 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

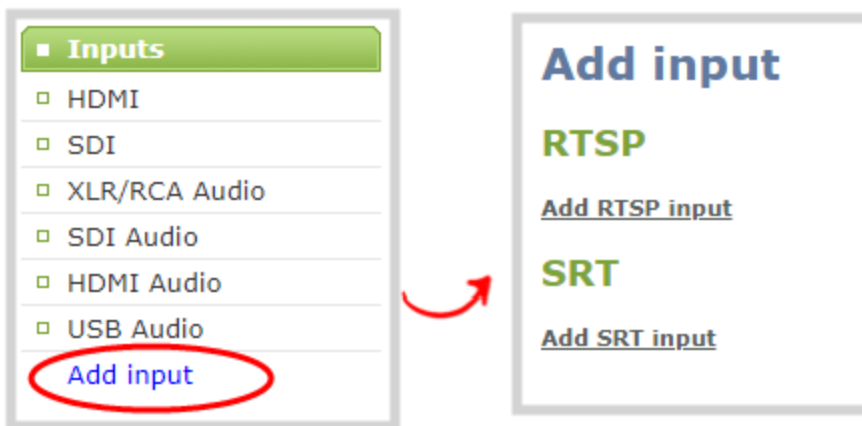
- If an RTSP source is connected but unused in any channel, Pearl Nano decodes only key frames to preserve CPU resources.
- Only one RTSP source can be used with Pearl Nano.
- To synchronize timestamps between your RTSP source and your Pearl Nano, the same time synchronization server should be used for both devices. We recommend that you configure an NTP server on your Pearl Nano and use Pearl Nano as a time synchronization server for your RTSP source. See [Configure a time server](#).



The timestamps of an RTSP source and Pearl Nano tend to gradually go out of sync. If there's a **2500 -3000 ms** difference between the timestamp of your RTSP source and Pearl Nano, 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 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 Nano as an RTSP source, see [Share a live broadcast stream \(HTTP, HTTPS or RTSP\)](#).

RTSP Input RTSP 1

The input is not used in channels

[Delete this input](#)

Status

Not Configured

Settings

Input URL:

Username:

Password:

Preferred transport:

Audio delay: from -300 to 300 ms

"No signal" image

Image:

Timeout: second(s)

[Apply](#)

Stream info


[check](#)

- (Optional) Rename the RTSP source, see [Rename an input port](#).
- (Optional) Configure a custom "No signal" image, see [Add a custom No Signal image](#).
- 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.

Status

CONNECTED

 Source time and system time not synchronized.

Video: H.264 1920x1080@30.1 6.55Mbps
Audio: AAC 44.1kHz stereo 3kbps

Packet loss statistics for last 10 minutes

	Expected	Received	Lost	%
Video	400443	400443	0.00	
Audio	5223	5223	0.00	

Alternatively, you can view stream connection information when you click **check** at the bottom of the page.

Stream info

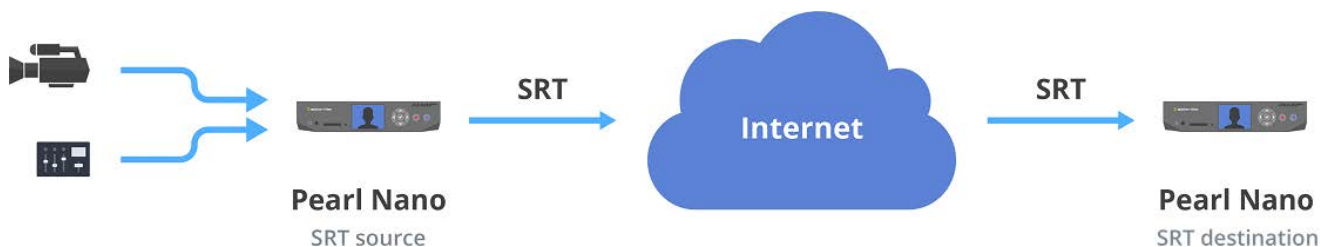
[check](#)

Title: 10
Video: H.264 1920x1080@30.0
Audio: AAC 44.1KHz stereo

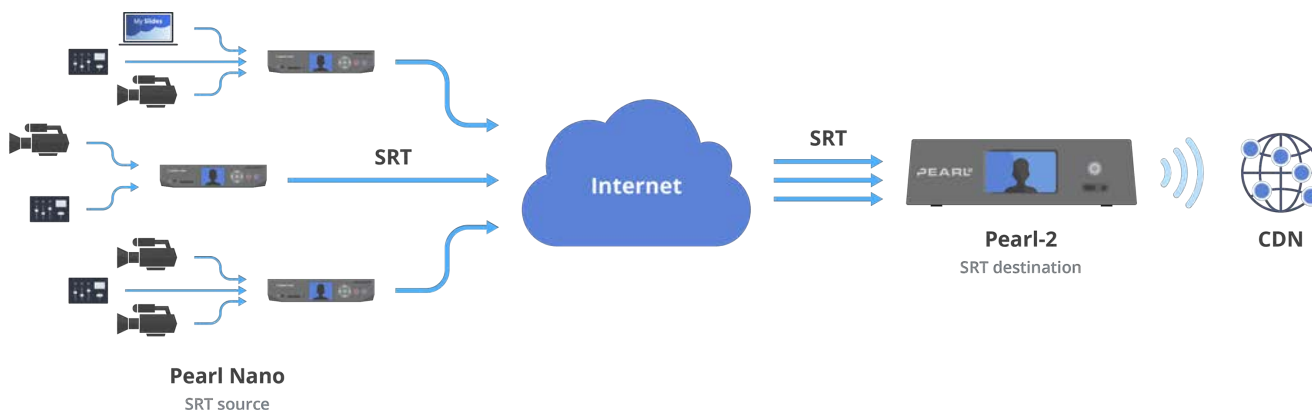
Connect an SRT stream as an input

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 such as a Pearl Nano.

You can configure Pearl Nano as an SRT destination (decoder) and ingest an SRT stream as a video input that you can add to the custom layout for recording and streaming. Up to one of the video inputs you configure for Pearl Nano can be from an SRT source.



Pearl Nano as SRT source encoders in a multiple-source setup.



When adding an SRT input on Pearl Nano, 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 on Pearl Nano to rendezvous mode. If the SRT source stream is using caller mode, then set the SRT input on Pearl Nano 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 on Pearl Nano 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 Nano to use the corresponding mode. 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 Nano supports 128 bits, 192 bits, and 256 bits AES encryption. Special characters are not supported in the passphrase.

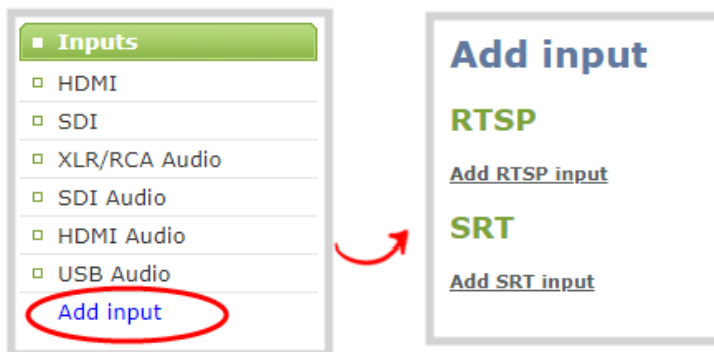


If AES encryption and a passphrase is configured, ensure this information is provided to the SRT source. The SRT stream from the source must use the same AES and passphrase values, see [Set AES encryption and a passphrase for SRT](#).

Add an SRT stream as an input using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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 to use for this input.
 - a. If **Caller** mode is selected, do the following:
 - i. Enter the **URL** of the SRT source (encoder) using the format `srt://<encoder-ip-address>:<port>`, where the `<encoder-ip-address>` and `<port>` could be another Pearl Nano device sending an SRT stream.
 - ii. (Optional) In the **Source port** field, enter the port number for this device to use for SRT traffic.
 - b. If **Listener** mode is selected, enter the **Port** number for this device to use for SRT traffic. See [Network ports used by Pearl Nano](#) to determine available ports.
 - c. If **Rendezvous** mode is selected, enter the **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 such as a second Pearl Nano.



SRT Input SRT 1

The input is not used in channels

[Delete this input](#)

Status

Listening
■

Settings

Connection mode: Caller

URL: srt://192.168.1.10:1000

Source port: 3000

Stream ID: SRT 1

Encryption

Key length: AES-128

Passphrase:

Latency: 80 ms

Audio delay: 0 from -300 to 300 ms

"No signal" image

Image: DEFAULT

Timeout: 5 second(s)

[Apply](#)

4. (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.
5. (Optional) If a security **Passphrase** is required along with AES encryption, you can enter that here.
6. 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](#).

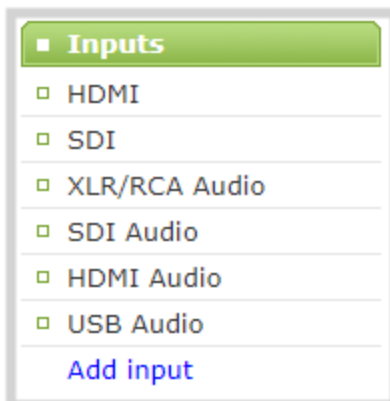
Preview a video source using the Admin Panel

You can preview the images captured from your video sources in the Admin panel.

Preview an input source using the Admin panel

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

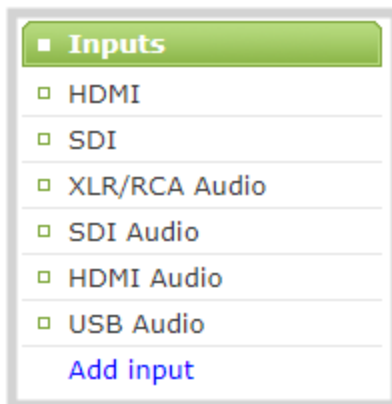
Sometimes it's helpful to configure the input port name to match the data it's capturing so that it's clear what the channel is capturing. Alternately you can change the channel's name, see [Rename a channel](#).

You can include certain international characters for video and audio input port names. Pearl Nano supports common character sets for Western and Central European languages, Nordic languages, and Russian. The name should not include special characters, slashes, or spaces. For a complete list, see [International character support](#).

To change an input port name:

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).

- From the Inputs menu, click the **source name**. The configuration page for the source opens.



- Click on the input port name that appears at the top of the page. The text turns red.
- Enter the new name using alphanumeric characters. We recommend using underscores to separate words rather than using spaces.
- 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:

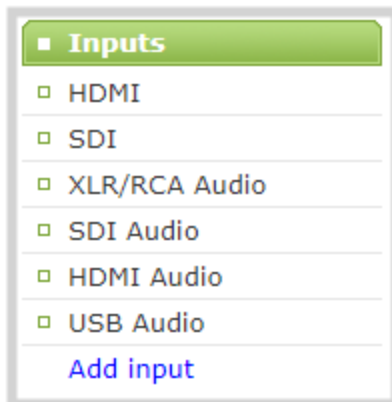
- [HDMI and DVI video settings](#)
- [SDI video settings](#)

For details to configure networked video sources on your Pearl Nano like RTSP and SRT, see:

- [Connect an RTSP source](#)
- [Connect an SRT stream as an input](#)

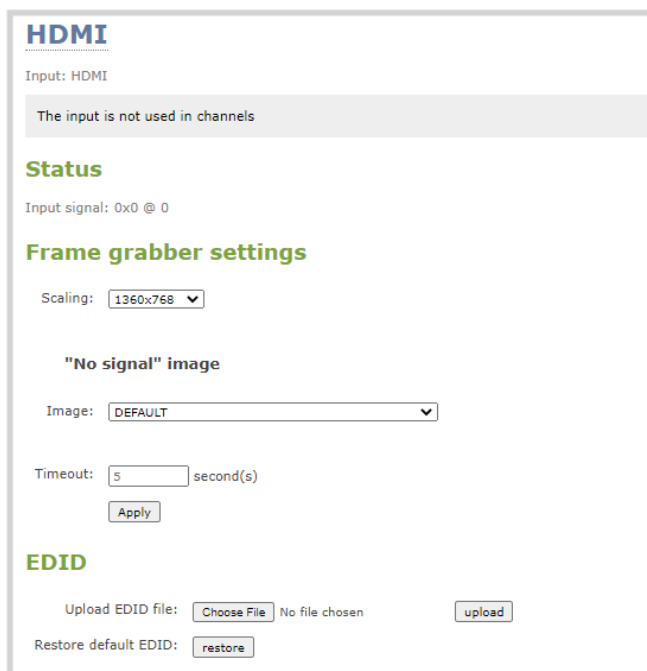
Open the configuration page for an input source using the Admin panel

- Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
- Ensure a source is connected to the input port, see [About connecting video and audio sources](#).
- From the Inputs menu, click the **source name**. The configuration page for the source opens.



HDMI and DVI video settings

The following options are available for HDMI and DVI video input sources connected to the HDMI port:

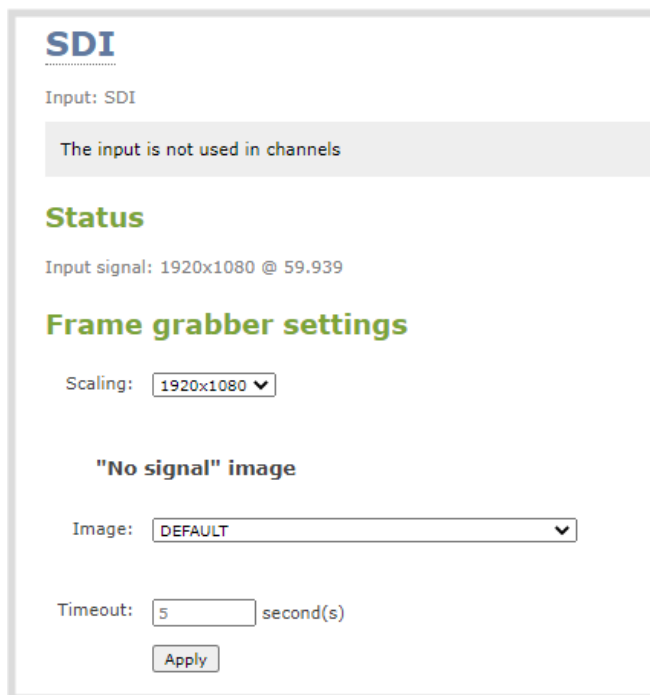


Value	Description
Scaling	Use this setting to scale the video input source. This is useful when adding multiple video sources in a custom layout such as picture in picture or side-by-side. The frame size selected for the video source is also what gets sent out the HDMI OUT port when you select the video input as the output source.
Image	This menu allows you to choose a custom no-signal image for the channel. The

Value	Description
	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.

SDI video settings

The following options are available for signals via the SDI port.



Value	Description
Scaling	Use this setting to scale the video input source. This is useful when adding multiple video sources in a custom layout such as picture in picture or side-by-side. The frame size selected for the video source is what gets sent out the HDMI OUT port.
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

Value	Description
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.

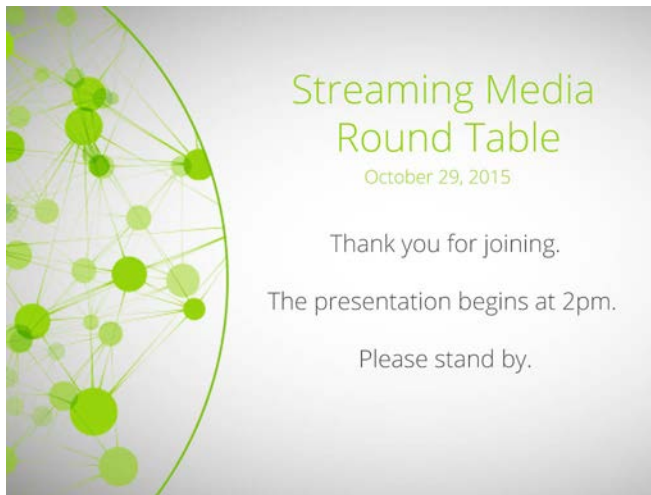
Add a custom No Signal image

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 Pearl Nano. 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 Pearl Nano, you must upload it, see [Upload or remove an image 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 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](#).

PART 3: 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 Nano 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, MPEG-DASH, RTMP, SAP, UPnP, 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 Nano's front screen menu to start/stop scheduled CMS webcasts, see [Stop/start scheduled CMS events using the front screen menu](#).

For information about streaming to Content Management Systems (CMSs) like Kaltura and Panopto, see [CMS recording and webcasting control on Pearl Nano](#).

What is streaming?

After you connect your camera, audio source, and set up a channel with a custom layout, it's time to stream your content live and share that with your viewers.

Pearl Nano provides many different streaming options and supports a variety of streaming protocols. Probably the easiest way to stream a single Pearl Nano 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, Pearl Nano can stream to a multicast server or CDN and reach viewers across the globe. Pearl Nano can even stream to smart TVs in overflow rooms using SAP or UPnP. 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 Nano can stream to a CDN or media server using any of the following streaming protocols:

- SRT (push)
- HLS (push)
- MPEG-DASH (push)
- RTMP/RTMPS (push)
- RTSP

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 Nano makes it easy to start and stop streaming using Streaming key located on the front panel.

In addition to streaming out from Pearl Nano, the following streaming formats are supported as input sources that Pearl Nano can ingest:

- SRT
- RTSP announce
- RTMP push

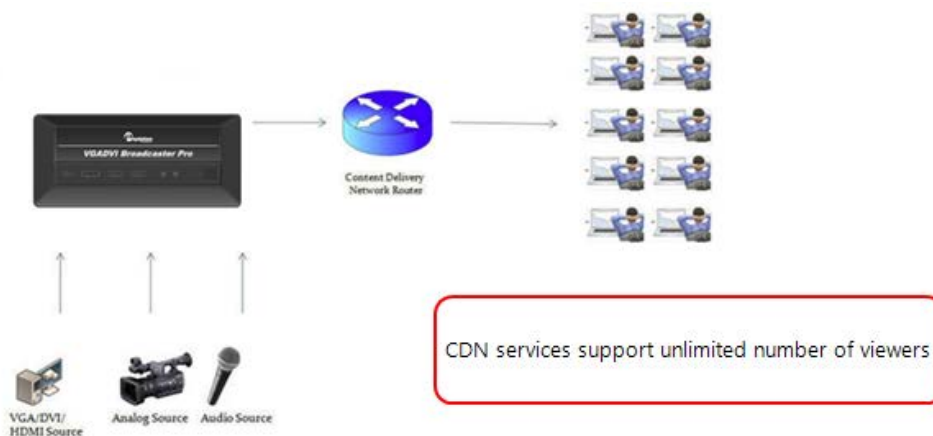
Pearl Nano also comes with APIs so you can setup third party tools to control streaming, see the [Pearl System API Guide](#) for details.

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 on Pearl Nano](#)

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.

Whether you're streaming to CDNs or multicasting across a LAN, Pearl Nano can publish to multiple destinations at the same time. Streaming a channel to CDNs and multicast streaming at the same time is available only when the H.264 codec is configured as the channel encoding, see [Configure video encoding](#).

Publishing Options	Use this option to...
Content Distribution Network (CDN)	<p>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.</p> <p>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.</p> <p>Streaming protocols supported include: SRT (push), HLS (push), MPEG-DASH (push), RTMP/RTMPS.</p> <p>For more information about streaming to a CDN, see Streaming to servers, CDNs, and other devices.</p>
Multicast Streaming	<p>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.</p> <p>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.</p> <p>Multicast streaming protocols supported include: MPEG-TS UDP, MPEG-TS RTP/UDP, and RTP/UDP.</p> <p>For more information about using multicasting for streaming your content, see Multicast streaming</p>



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.

You can even use an XML profile to setup streaming if the CDN supports that. By default, no streaming is configured for the channels configured on Pearl Nano.

In addition to streaming, Pearl Nano can ingest streams as input sources. The following ingest streams formats are supported:

- SRT (push)
- RTSP announce
- RTMP (push)

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
- select the H.264 codec from the channel's Encoding page

You can control streaming to a CDN using the Admin panel or the Streaming key on the front panel. 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

Pearl Nano supports streaming to multiple destinations. A stream uses the channel's encoding settings. Therefore, all streams you create for the channel have the same encoding settings.

Directly sharing channel stream URLs with viewers

People on the same local network as Pearl Nano 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 if you've set one for viewers, see [Set or change user passwords](#).

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, see [View the live broadcast URL using a web browser](#) and [View the streaming URL using a media player](#). For more information on compatibility between codecs and streaming formats, see [Viewing a channel's live broadcast stream](#).

MPEG-TS: Used in broadcast systems such as DVB, ATSC and IPTV. It is supported by media players such as MPlayer, VLC and KMPlayer.

RTSP: Supported by most media players including QuickTime, MPlayer and VLC. Supports H.264 and MPEG4 standards and analog audio from an external source.

Stream info

Live broadcast: <http://192.168.0.183/preview.cgi?channel=1>

Video: H.264 1920x1080@30, 6.47 Mbps

Actual framerate: 30

Audio: AAC 44kHz stereo 320 kbps

Total: 6.79 Mbps

RTSP stream <rtsp://192.168.0.183:554/stream.sdp>

MPEG-TS stream <http://192.168.0.183:8000/stream.ts>

Flash stream <http://192.168.0.183:8000/stream.flv>

FLV: Supported on most web browsers and media players. Supports the H.264 standard and analog audio from an external source.

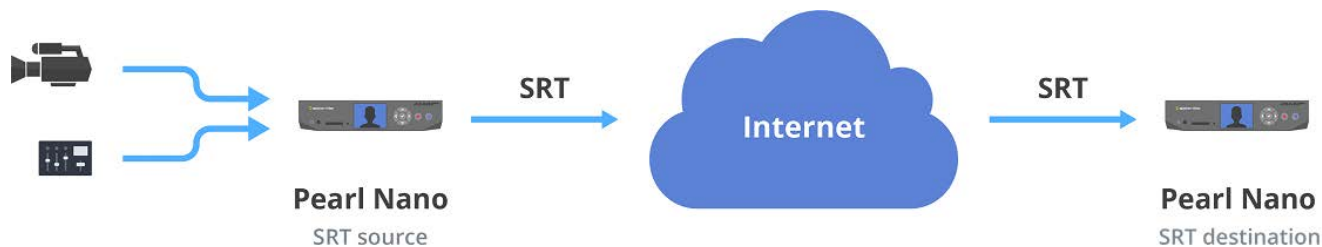


HTTP only is used for MPEG-TS and FLV streaming. HTTPS is not supported.

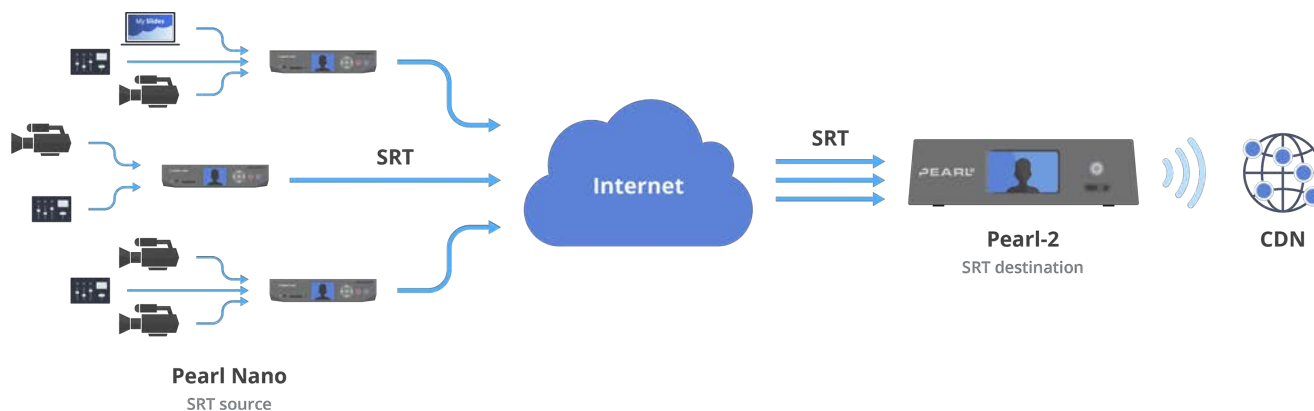
About streaming using SRT

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 Nano as an SRT source encoder and stream video using SRT. You can also configure Pearl Nano as an SRT decoder and ingest SRT streams as video inputs. Up to one of the video inputs you configure for Pearl can be from an SRT source and Pearl Nano can stream up to three SRT streams.



Pearl Nano as SRT source encoders in a multiple-source setup.



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.

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 Nano 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 with Pearl Nano.

- 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.
- Stream MPEG-DASH (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 Pearl Nano (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 your Pearl Nano.

Table 43 Suggested stream settings for video

Option	Setting
Codec	H.264
Video encoding preset	Hardware accelerated
Video encoding profile	High
Key frame interval	2 sec ¹
Limit frame rate	30 ¹
Bitrate	4000 kbps for HD 6000 kbps for Full HD 4000 kbps for HD; 6000 kbps for Full HD (Mac)
Audio format	AAC 22 KHz ¹

¹For HLS streaming, the key frame interval should be set to 2s and the frame rate should be set to 60 fps (or 59.94) 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 44 Suggested stream settings for slides

Option	Setting
Codec	H.264
Video encoding preset	Hardware accelerated
Video encoding profile	High
Key frame interval	2 sec
Limit frame rate	30
Bitrate	1000 kbps for HD; 2000 kbps for Full HD
Audio format	AAC 44 KHz

Streaming a channel direct to viewers

Pearl Nano is ready to 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 45 Publishing options for streaming direct to viewers on the local network

Publishing Options	Use this option to...
HTTP or HTTPS	<p>Viewers on the same local network as Pearl Nano can access the Live broadcast URL using a web browser on the local network and are instantly connected.</p> <p>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.</p> <p>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 Nano. For more information about using an HTTP stream, see Share a live broadcast stream (HTTP, HTTPS or RTSP).</p>
RTSP	<p>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).</p>
HTTP Live Streaming (HLS) pull	<p>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 Nano, traffic from port 80 is redirected to port 443. See Enable HLS (pull) for details.</p> <p>There is approximately a 30 second delay when streaming using HLS.</p>



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 Nano 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 \(pull\)](#)
- [Stream using UPnP](#)

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 Nano, which can be done through network discovery using Pearl's serial number or IP address. Pearl Nano must be accessible on the viewer's LAN for them to access and view the stream using serial discovery.

If HTTPS is configured for Pearl Nano, the live broadcast URL will start with *https* instead of *http*.



If Pearl Nano 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 46 URL options

Access Method	URL Format
serial discovery	<div style="border: 1px solid #ccc; padding: 10px; background-color: #e6f2ff;"> <pre>http://<serial>.local/preview.cgi?channel=<channel number> https://<serial>.local/preview.cgi?channel=<channel number> rtsp://<serial>.local:<port>/stream.sdp</pre> </div> <p>Where <i>serial</i> is the serial number of the system, the <i>port</i> number for the channel is found on the Info page, and the channel number is provided from the Admin panel.</p> <p>You must install Bonjour Print Services on your Windows or Mac computer to access the live Preview using the serial number.</p>
IP address	<div style="border: 1px solid #ccc; padding: 10px; background-color: #e6f2ff;"> <pre>http://<IP Address>/preview.cgi?channel=2 https://<IP Address>/preview.cgi?channel=2</pre> </div>

Access Method	URL Format
	<div style="border: 1px solid #ccc; padding: 10px; background-color: #e6f2ff; margin-bottom: 10px;"> <code>rtsp://<IP Address>:<port>/stream.sdp</code> </div> <p>Where <i>IP address</i> is the IP address of the system, the <i>port</i> number for the channel is found on the Info page, and the channel number is provided from the Admin panel.</p>

Retrieve the stream URL for your viewers using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select the channel and click **Status**. The Status page appears.

Stream info

Live broadcast: <http://10.2.3.72/preview.cgi?channel=1>

Video: H.264 1920x1080@30, 5.60 Mbps
Actual framerate: 30


Audio: AAC 48kHz stereo 320 kbps
Total: 5.92 Mbps

Flash stream <http://10.2.3.72:8000/stream.flv>
MPEG-TS stream <http://10.2.3.72:8000/stream.ts>
RTSP stream <rtsp://10.2.3.72:554/stream.sdp>

open from your browser

open from a media player

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 Admin panel**.

Enable HLS (pull)

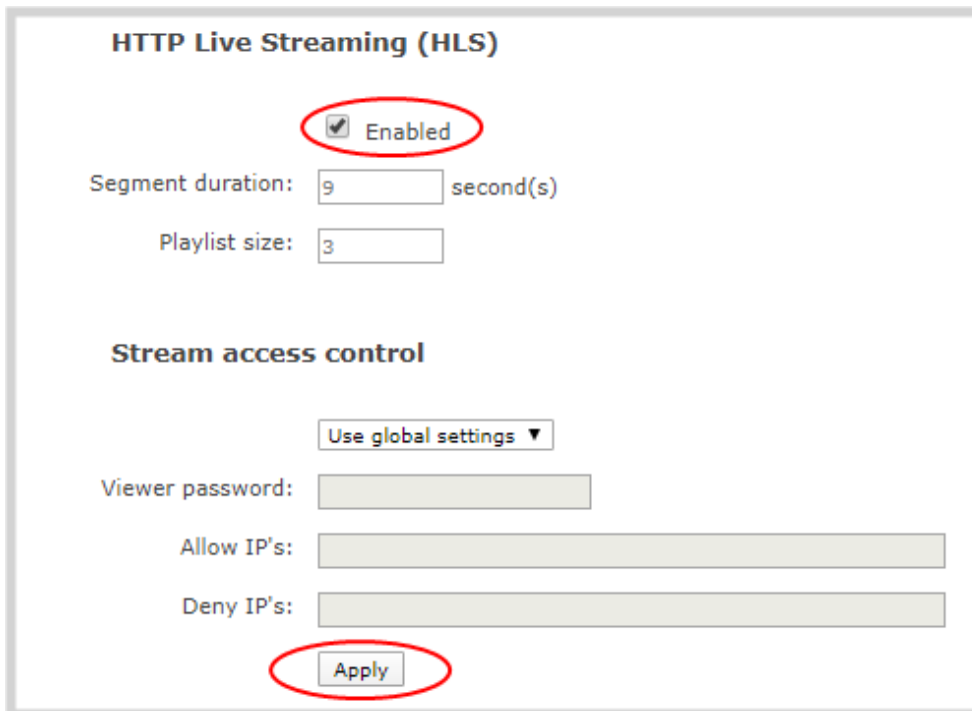
Stream a live broadcast of a channel directly to viewers on the same local network as Pearl Nano using HTTP over port 80. This gives viewers with iOS devices convenient access to the channel's live broadcast. If HTTPS is configured for Pearl Nano, the traffic from port 80 is redirected to HTTPS port 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 Admin panel](#).
2. From the Channel 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**.



HTTP Live Streaming (HLS)

Enabled

Segment duration: second(s)

Playlist size:

Stream access control

▼

Viewer password:

Allow IP's:

Deny IP's:

4. (Optional) Set the **Segment duration** and **Playlist size**.
5. Click **Apply**
6. 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.

```

Services state

Encoder: up 9 seconds
Broadcaster: up 11 seconds
HTTP Live Streamer: up 11 seconds
Recorder: disabled

Stream info


Live broadcast: http://192.168.1.57/preview.cgi?channel=1
HTTP Live Streaming: http://192.168.1.57/hls/channel1

Video: H.264 1024x768@30, 6.00 Mbps
Actual framerate: 30
Audio: MP3 22kHz mono 128 kbps
Total: 6.13 Mbps
RTSP stream rtp://192.168.1.57:554/stream.sdp
MPEG-TS stream http://192.168.1.57:8000/stream.ts
Flash stream http://192.168.1.57:8000/stream.flv
HLS stream http://192.168.1.57/hls/channel1/stream.m3u8
    
```

Open the link using a media player

Restrict viewer access to channel streams

Pearl Nano can restrict access to all viewer streams from the channel using global viewer passwords and IP allow/deny lists. See [Set or change user passwords](#) and [Restrict viewers by IP address](#).



If LDAP is configured for viewer authentication, the viewer must pass global authentication 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 Admin panel](#).
3. From the Channel menu, select the channel and click **Streaming**. The streaming configuration page opens.
4. In the **Stream access control** section, select **Use these settings** from the drop down.

Stream access control


Use global settings ▼

Viewer password:


Allow IP's:

Deny IP's:

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.

- (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.

- (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.
- Click **Apply**.

Restrict viewers by IP address

Pearl Nano permits 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.

Item	Description
Allow IP's	Users connecting from addresses in this list are permitted to view broadcasts from the

Item	Description
	<p>system, provided their IP address is not in the Deny IP's list.</p> <p>To allow all except IP addresses in the deny list, if any, leave the field blank.</p> <p>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.</p>
Deny IP's	<p>Users connecting from addresses in this list are not allowed to view broadcasts from the system, 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.</p> <p>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.</p>

If your viewer account has a password, your viewers must connect to the system 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.

Table 47 IP Based Restriction Options

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 on a channel by their IP address

1. Login to the Admin panel as **admin**, see [Connect to 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 example allow lists.

Table 48 Example allow lists

Example	Description
<p>Allow list with distinct IP addresses</p>	<p>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.</p> <p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p>Allow: 192.168.1.50, 192.168.1.51, 192.168.1.75</p> </div>
<p>Allow list with a range of IP addresses</p>	<p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 10px; margin: 10px 0;"> <p>Allow: 192.168.1.200-192.168.1.250</p> </div> <p>Note that we could have specified two of the IP addresses in the previous example as a range.</p>
<p>Allow list with a range of IP addresses and one or more</p>	<p>Putting the first two examples together, we want to permit access to IP addresses in the range of boardroom computers (192.168.1.200-</p>



Example	Description
<p>specific IP addresses</p>	<p>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:</p> <div style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <p>Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75</p> </div> <p>Your list can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.</p>
<p>Allow list with a range of IP addresses, distinct IP addresses, and an exception</p>	<p>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:</p> <div style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <p>Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75</p> <p>Deny: 192.168.1.211</p> </div> <p>Both lists can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.</p>

The following table lists some example deny lists.

Table 49 Example deny lists

Example	Description
<p>Deny list with distinct IP addresses</p>	<p>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.</p> <p>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</p>

Example	Description
	<p>computers except the boardroom computer:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 5px; margin: 10px 0;"> <p>Deny: 192.168.1.211</p> </div> <p>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.</p>
<p>Deny list with a range of IP addresses</p>	<p>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).</p> <p>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:</p> <div style="border: 1px solid #ccc; background-color: #e6f2ff; padding: 5px; margin: 10px 0;"> <p>Allow: 192.168.1.1-192.168.1.250</p> <p>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</p> </div>

Change HTTP and RTSP streaming port values

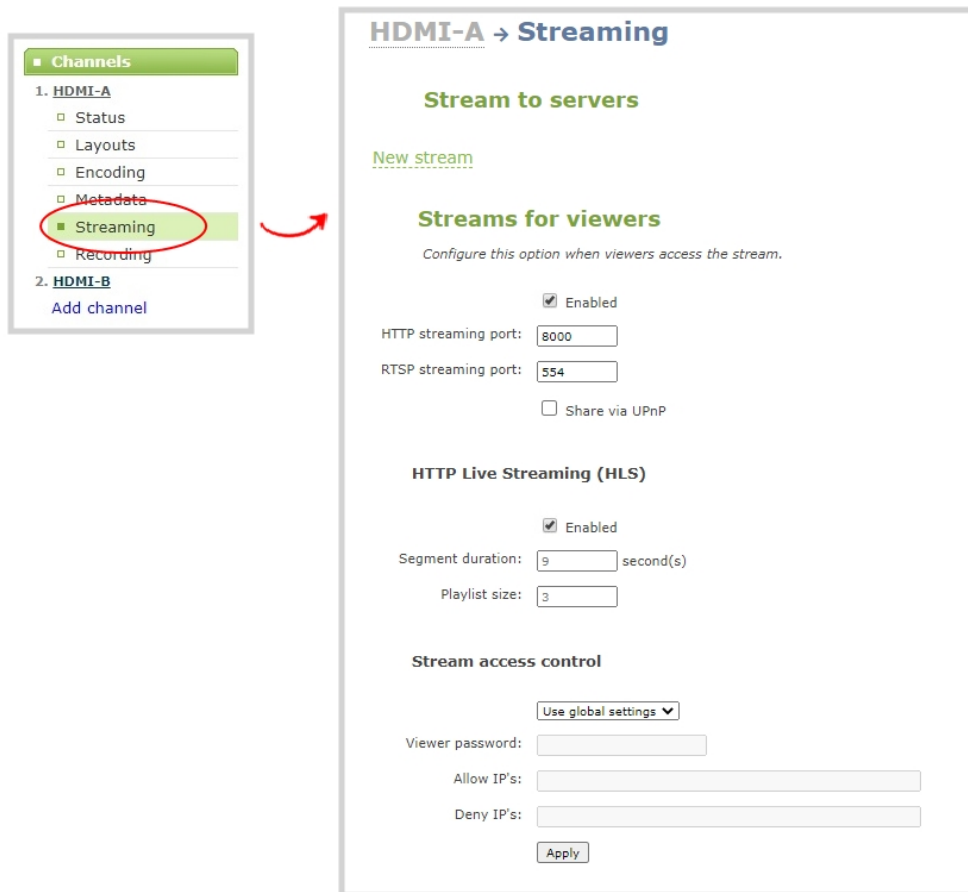
You can use the Admin panel to configure a specific streaming port value for the channel. Ensure that each channel has unique streaming port values that are not currently assigned to any other process, see [Network ports used by Pearl Nano](#).

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 Admin panel](#).
2. From the Channel 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.

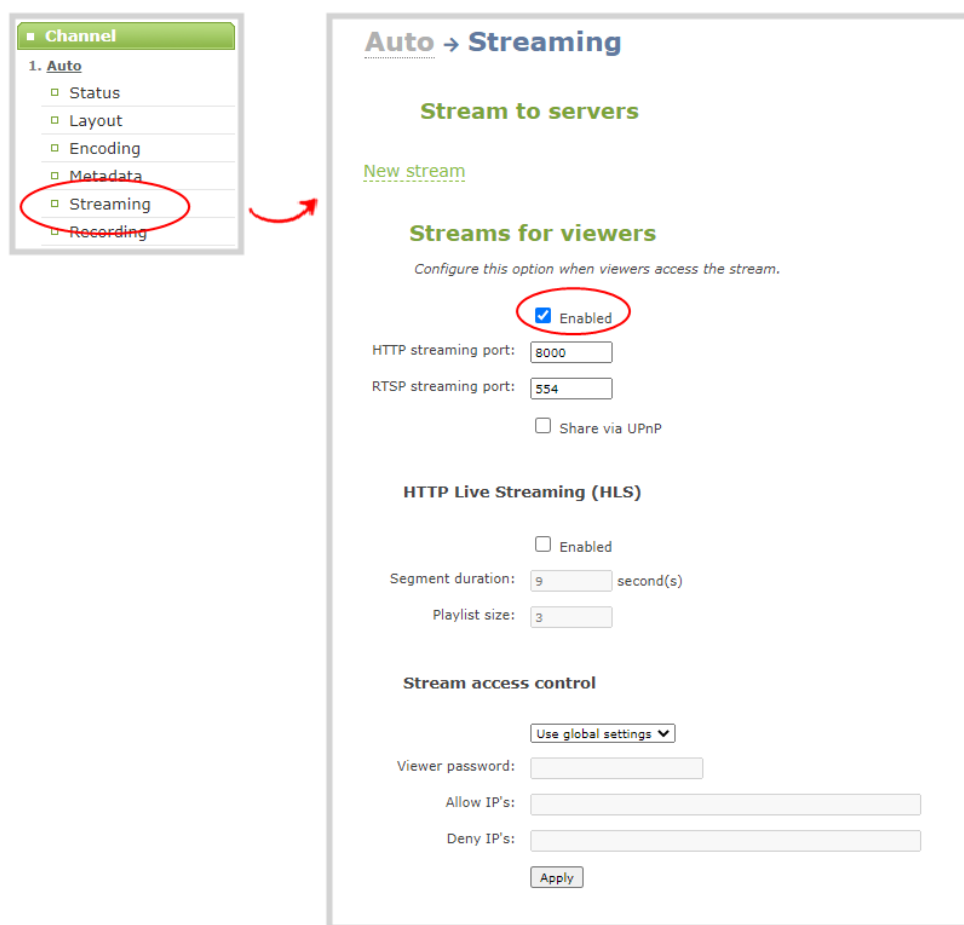
Disabling channel streaming for viewers using their web browser or media player does not disable live streaming to a CDN.



Disabling streams for viewers does disable all viewer formats, including: HTTP/HTTPS, RTSP, HLS and UPnP.

Disable or enable the channel streaming URLs using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select a channel and click **Streaming**. The streaming page opens.



The image shows two parts of the Admin panel. On the left is a 'Channel' menu with options: Auto, Status, Layout, Encoding, Metadata, Streaming, and Recording. The 'Streaming' option is circled in red, and a red arrow points from it to the right. On the right is the 'Auto → Streaming' configuration page. It has sections for 'Stream to servers', 'Streams for viewers', and 'HTTP Live Streaming (HLS)'. In the 'Streams for viewers' section, the 'Enabled' checkbox is checked and circled in red. Below it are input fields for 'HTTP streaming port' (8000) and 'RTSP streaming port' (554), and an unchecked 'Share via UPnP' checkbox. The 'HTTP Live Streaming (HLS)' section has an unchecked 'Enabled' checkbox, 'Segment duration' (9 seconds), and 'Playlist size' (3). The 'Stream access control' section has a 'Use global settings' dropdown, 'Viewer password', 'Allow IP's', and 'Deny IP's' fields, and an 'Apply' button.

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 Nano 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 [Set or 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.

Stream info

Live broadcast: <http://10.2.3.72/preview.cgi?channel=1>

Video: H.264 1920x1080@30, 5.60 Mbps

Actual framerate: 30

Audio: AAC 48kHz stereo 320 kbps

Total: 5.92 Mbps

Flash stream <http://10.2.3.72:8000/stream.flv>

MPEG-TS stream <http://10.2.3.72:8000/stream.ts>

RTSP stream <rtsp://10.2.3.72:554/stream.sdp>

Copy, paste, and share URL
addresses with viewers

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 such as DVB, ATSC and IPTV. It is supported by media players such as MPlayer, VLC and KMPlayer.

RTSP: Supported by most media players including QuickTime, MPlayer and VLC. Supports H.264 and MPEG4 standards and analog audio from an external source.

Stream info

Live broadcast: <http://192.168.0.183/preview.cgi?channel=1>

Video: H.264 1920x1080@30, 6.47 Mbps
Actual framerate: 30
Audio: AAC 44kHz stereo 320 kbps
Total: 6.79 Mbps
RTSP stream <rtsp://192.168.0.183:554/stream.sdp>
MPEG-TS stream <http://192.168.0.183:8000/stream.ts>
Flash stream <http://192.168.0.183:8000/stream.flv>

FLV: Supported on most web browsers and media players. Supports the H.264 standard and analog audio from an external source.



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 stream 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 Nano 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 stream 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](#).

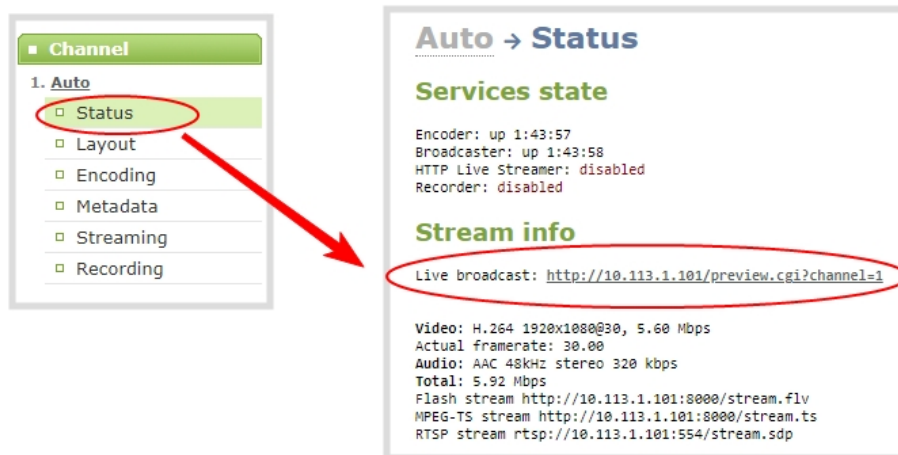
If a viewer password is configured, provide participants with the password to log in, along with the URL of the stream. To set a viewer password, see [Set or change user passwords](#).



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

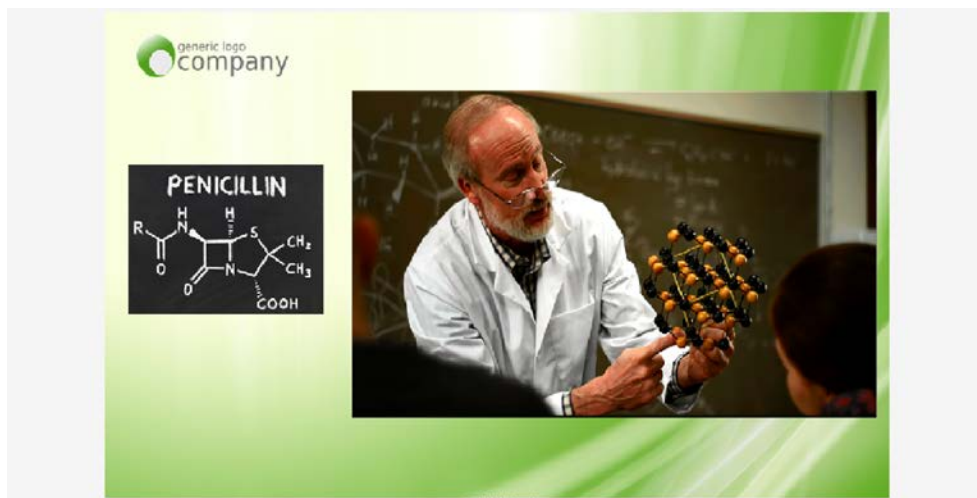
Share the live broadcast URL with viewers

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Channel menu, select a channel and click **Status**. 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** for 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 Nano 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 Nano or the serial number, see

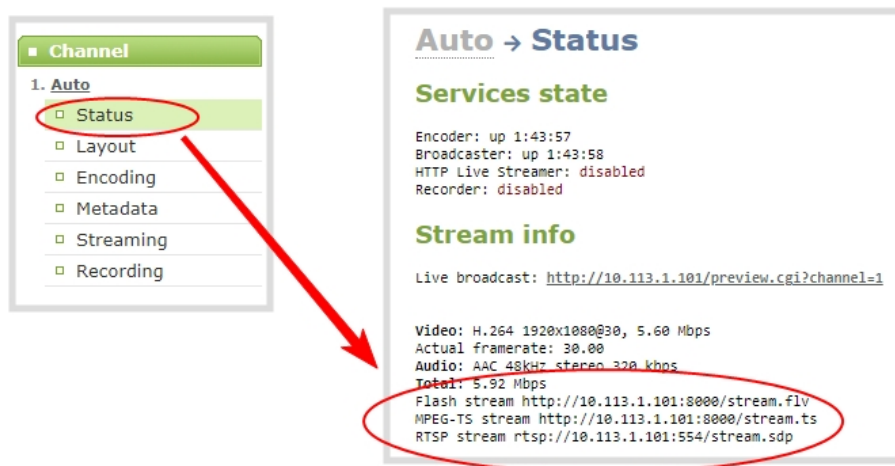
The type of stream URL you provide to your viewers can affect their choice of media player needed to watch the stream.

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 [Set or change user passwords](#).

Share the channel's stream URL with viewers

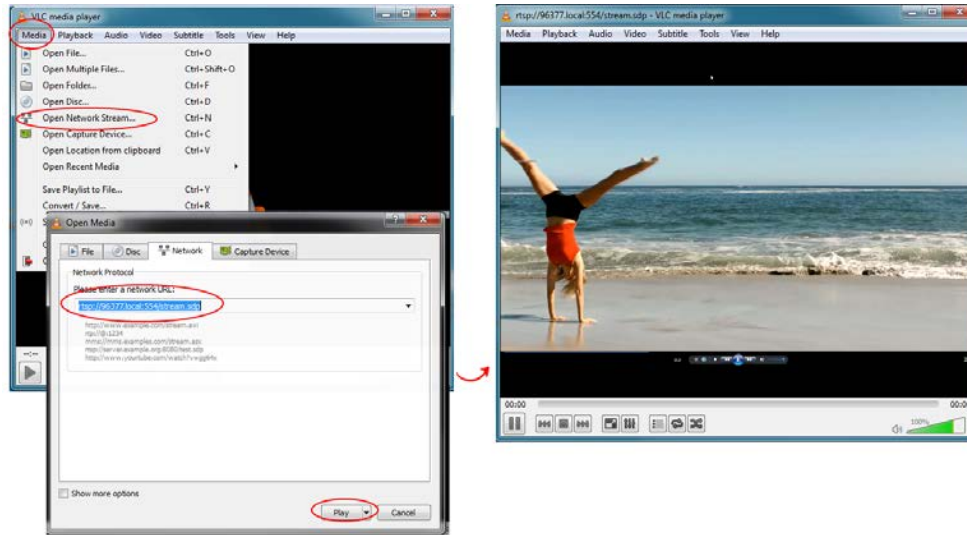
1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. Open the channel's status page and copy the channel's stream URL. From the Channel menu, select a channel and click **Status**. You can copy the Live broadcast URL and share that with your viewers.



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://.local:554/stream.sdp
```



4. Press **Play** to watch the stream in the media player window.

Streaming to servers, CDNs, and other devices

Pearl Nano can stream to CDNs, local media servers, and even to other Pearl Nano devices that are acting as a streaming ingestion point. Pearl Nano supports many streaming protocols, including: SRT (push), HLS (push), MPEG-DASH (push), RTMP/RTMPS, and RTSP. Use the Admin panel to set up individual channels configured on Pearl Nano 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 MPEG-DASH \(push\) stream](#)
- [Set up an RTSP announce stream](#)
- [Stream to a CDN using an XML profile](#)
- [Start and stop streaming to a CDN](#)

For details to configure multicast streaming, see [Multicast streaming](#). Streaming a channel to CDNs and multicast streaming is available only when the H.264 codec is configured as the channel encoding, see [Configure video encoding](#).

Set up an RTMP or RTMPS (push) stream

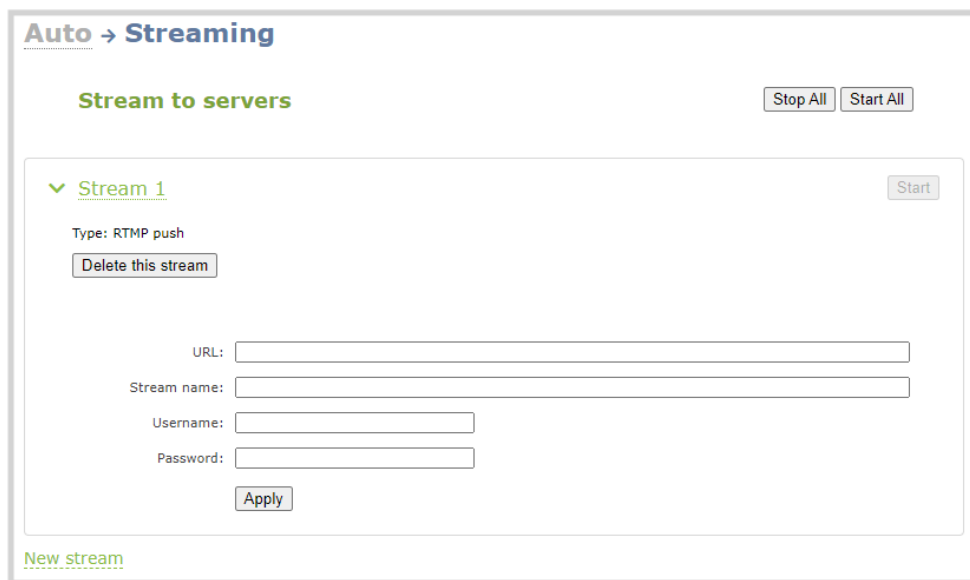
Real Time Messaging Protocol (RTMP) is this the most common way to stream to a CDN, including to Facebook Live and YouTube.

Use Real Time Messaging Protocol Secure (RTMPS) to encrypt content before it's streamed over a TLS/SSL connection for secure live streaming. When enabled, Pearl Nano 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 Nano can't find the CA certificate of your CDN in it's list of certificates.

Pearl Nano 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 Nano, 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 Admin panel](#).
2. From the Channel 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. 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...*
6. Enter the **Stream name** (which also is called a stream key by some CDNs)
7. (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.

- (Optional) Rename the stream. Click the current name and enter a different name, then press **Enter**.



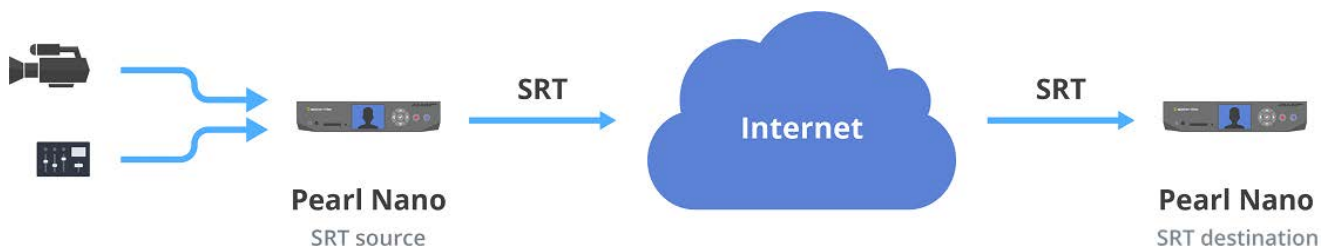
Refresh your browser if the new stream name doesn't immediately display.

- Click **Apply**.
- To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
- Click **Delete this stream** at any time to delete the stream.

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.

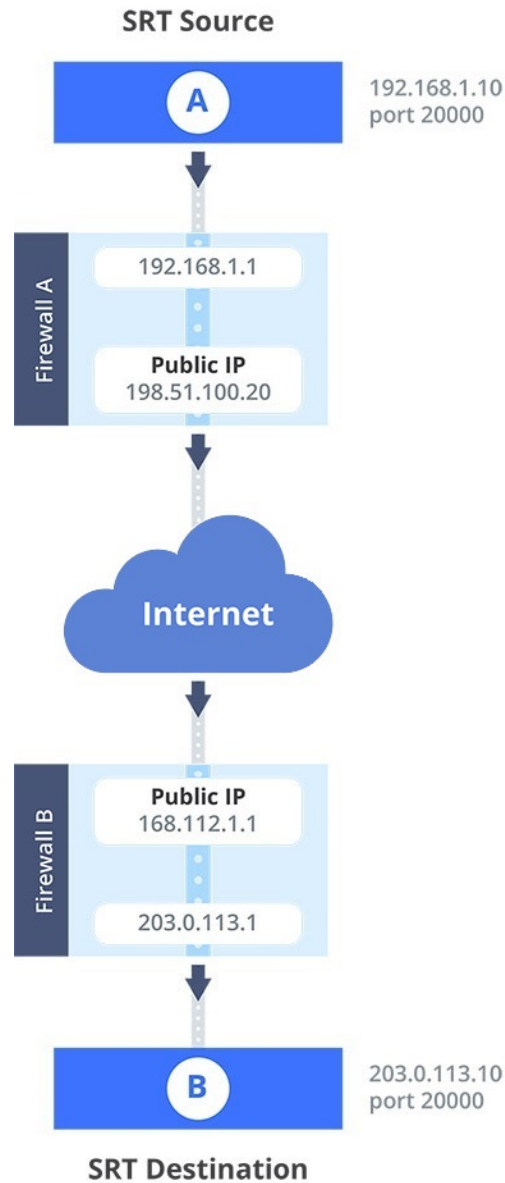
The easiest way to establish a link between the SRT source and destination devices is to use rendezvous mode. In rendezvous mode, both the SRT source and destination device are ready to establish the SRT connection as soon as an SRT stream starts.



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 Nano is setup as SRT Source A (192.168.1.10) with port 20000 and another Pearl Nano is setup 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

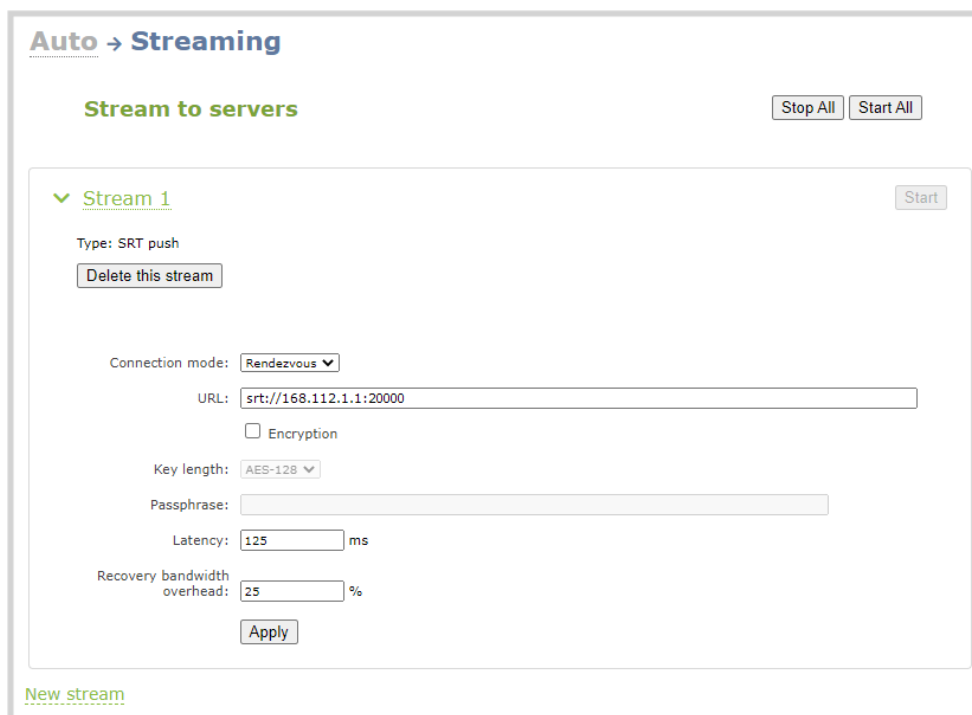
- The public IP address of Source A (e.g. 198.51.100.20) and the public IP address of Destination B (e.g. 168.0.113.10).
- The SRT streaming port that Source A is configured to use (e.g. port 20000).

- 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 Nano, 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 Nano, 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 Nano as a streaming source in rendezvous mode using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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.



The screenshot shows the 'Auto → Streaming' configuration page. At the top, there are 'Stream to servers' controls with 'Stop All' and 'Start All' buttons. Below this, a section for 'Stream 1' is expanded, showing its configuration. The 'Type' is 'SRT push' and there is a 'Delete this stream' button. The 'Connection mode' is set to 'Rendezvous'. The 'URL' field contains 'srt://168.112.1.1:20000'. There is an unchecked 'Encryption' checkbox. The 'Key length' is set to 'AES-128'. The 'Passphrase' field is empty. The 'Latency' is set to '125' ms. The 'Recovery bandwidth overhead' is set to '25' %. There is an 'Apply' button at the bottom of the configuration section. A 'Start' button is located in the top right corner of the stream configuration area. A 'New stream' link is visible at the bottom left of the configuration area.

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 Nano 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**

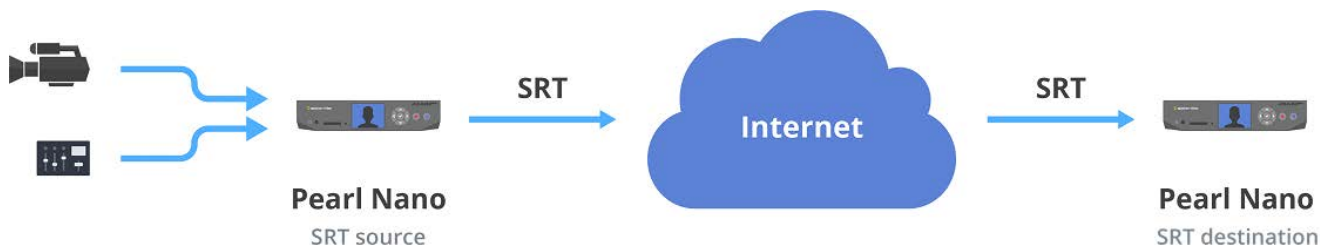
What's next?

If you also need to set up Pearl Nano as an SRT destination and ingest an SRT stream from a remote source, you must add the SRT stream as an input, see [Connect an SRT stream as an input](#).

Set up an SRT stream using caller and listener modes

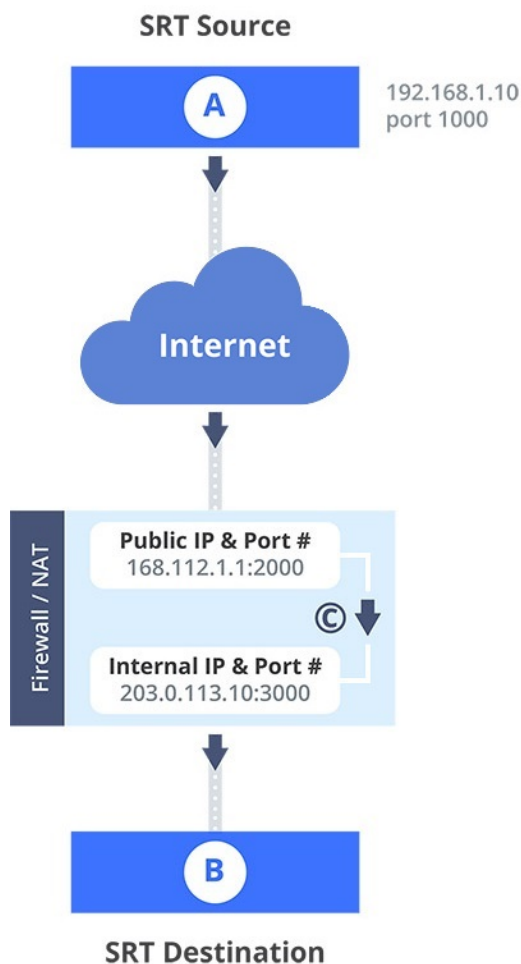
When setting up SRT streaming on Pearl Nano, you can configure Pearl Nano as an SRT source encoder and send an SRT stream over the Internet to other SRT destinations (decoders) such as a CDN or another Pearl Nano.

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, a Pearl Nano is setup as SRT Source A (192.168.1.10) and another Pearl Nano 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.

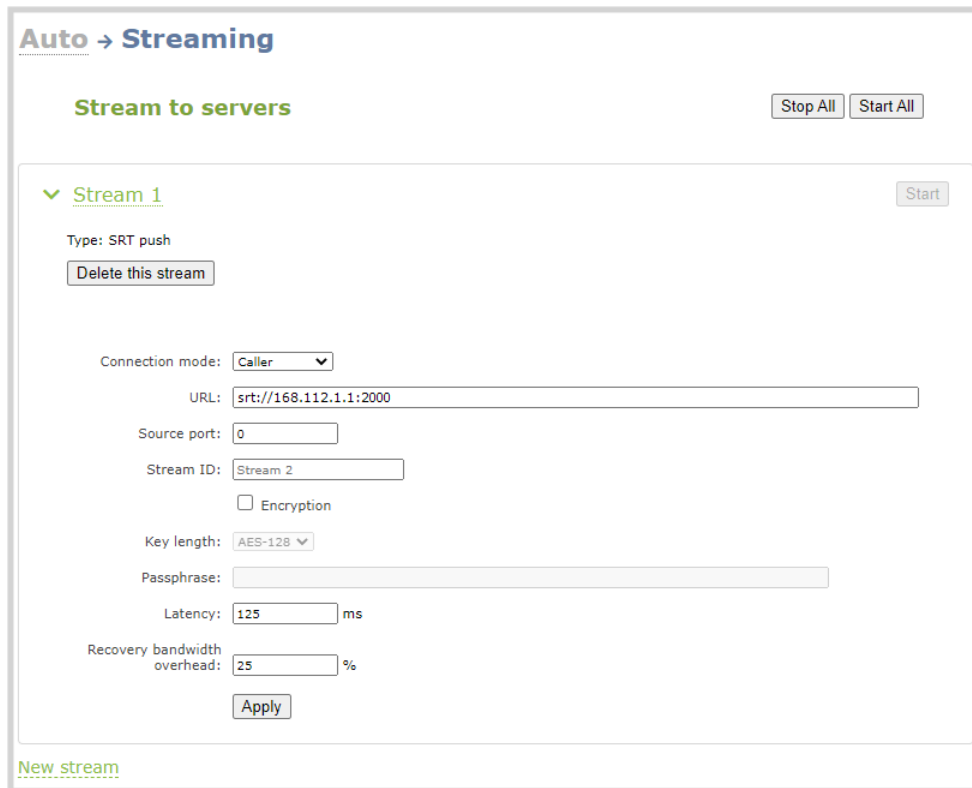
What's needed for this setup

- 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 Nano, 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 Nano as a streaming source in caller/listener mode using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select a 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.



Auto -> Streaming

Stream to servers Stop All Start All

▼ **Stream 1** Start

Type: SRT push Delete this stream

Connection mode: **Caller**

URL:

Source port:

Stream ID:

Encryption

Key length: **AES-128**

Passphrase:

Latency: ms

Recovery bandwidth overhead: %

Apply

[New stream](#)

4. Click the stream name to see the stream settings.
5. In the **Connection mode** field, select if this Pearl Nano 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 be another SRT decoder device such as a second Pearl Nano.
 - ii. (Optional) In the **Source port** field, enter the port number that this Pearl Nano should use for SRT traffic.
 - b. If **Listener** is selected, enter the **Port** number that this Pearl Nano should use for SRT traffic. See [Network ports used by Pearl Nano](#) 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.

- (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](#).

- (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%.
- (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.

- Click **Apply**.
- When your ready to start streaming, click **Start**

What's next?

If you also need to set up Pearl Nano 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 Nano. 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 Nano is configured as an SRT source. If Pearl Nano 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.

▼ **Stream 1** 03:59 Stop

Type: SRT push

Delete this stream

Statistics ^

Round Trip Time	16.506ms	Packet loss %	0.53
Latency	2000ms	Re-sent packets	740
Send rate	6.860 Mbps	Total packets sent/lost	141526/747
Buffer	1ms		

Single touch control

Connection mode: Rendezvous

URL:

Encryption

Key length: AES-128

Passphrase:

Latency: ms

Recovery bandwidth overhead: %

Apply

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:

$$SRT\ Latency = RTT\ Multiplier \times RTT$$

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 50 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: $49.518 = 3 \times 16.506$ ms or 50 ms of latency (rounded up).

To adjust the latency and recovery bandwidth overhead for an SRT stream using the Admin panel:

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. View the SRT statistics for the active stream. Do one of the following:
 - a. To open the SRT statistics from the Channels 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.

SRT Input SRT 1

[Delete this input](#)

Status

Connected 16 seconds

H.264 1920x1080@30.00 5.87Mbps
AAC 48kHz stereo 332kbps

Statistics ^

Round Trip Time	.52ms	Packet loss %	0.00
Latency	125ms	Re-sent packets	0
Receive rate	6.626 Mbps	Total packets received/lost	13048/0
Buffer	126ms		

Settings

Connection mode:

Port:

Encryption

Key length:

Passphrase:

Latency: ms

Use hardware acceleration

Audio delay: from -300 to 300 ms



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.

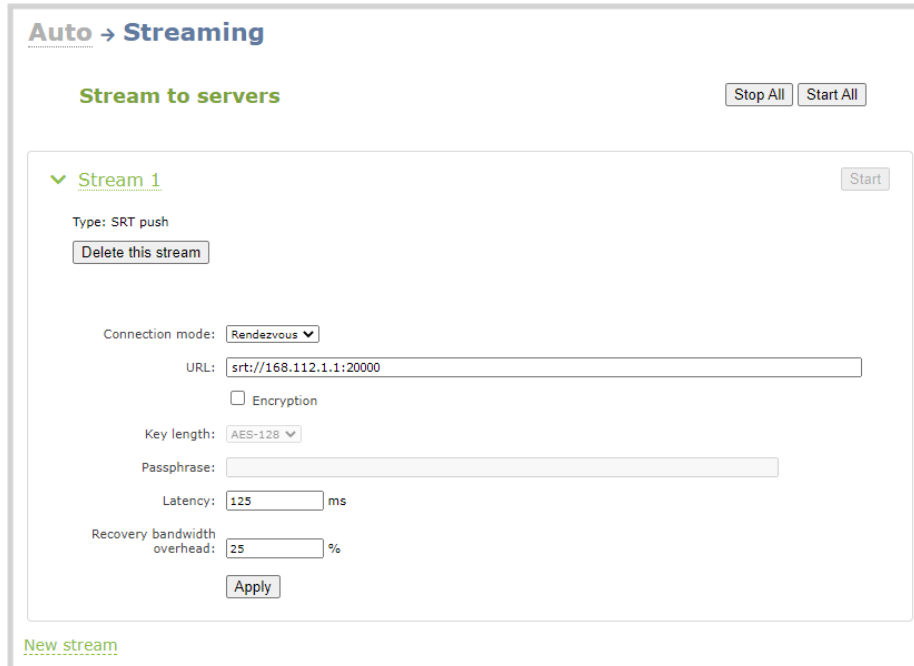
Set AES encryption and a passphrase for SRT

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 largest key length setting is what both devices will use for the stream. 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. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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.



Auto → Streaming

Stream to servers Stop All Start All

▼ **Stream 1** Start

Type: SRT push

Delete this stream

Connection mode: **Rendezvous** ▼

URL:

Encryption

Key length: **AES-128** ▼

Passphrase:

Latency: ms

Recovery bandwidth overhead: %

Apply

[New stream](#)

4. Check Encryption and choose the **Key length**.
5. In the **Passphrase** field, enter the passphrase using alphanumeric characters (if required).
6. Click **Apply**.

Set up AES encryption and a passphrase for an SRT input using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Inputs menu, select the SRT input you want to configure. The SRT input configuration page opens.

SRT Input SRT 1

The input is not used in channels

[Delete this input](#)

Status

Listening
■

Settings

Connection mode:

URL:

Source port:

Stream ID:

Encryption

Key length:

Passphrase:

Latency: ms

Audio delay: from -300 to 300 ms

"No signal" image

Image:

Timeout: second(s)

[Apply](#)

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 Nano 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

Nano must be configured for H.264 and AAC audio codec to stream using HLS. Pearl Nano 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.
- Set H.264 as the video encoding for the channel that's streaming.
- 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 Admin panel](#).
2. From the Channel, 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.

✓ **Stream 1**
Start

Type: HLS push

Delete this stream

Media Playlist URL:

Segment template:

Username:

Password:

Method: POST ▼

Segment duration: seconds

Playlist size:

Advanced settings ▼

Apply

[New stream](#)

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 Nano 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**.

Set up an MPEG-DASH (push) stream

MPEG-DASH (Dynamic Adaptive Streaming over HTTP) is an open standard, 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 can 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.

As an open standard, MPEG-DASH is designed to be codec and resolution agnostic. Pearl Nano can send a single resolution and bitrate MPEG-DASH 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 Nano must be configured for H.264 and AAC audio codec to stream using MPEG-DASH. Pearl Nano supports MD5, SHA-256, and SHA-512 hashing algorithms to authenticate the stream.

MPEG-DASH uses an MPEG2-TS transport stream container with a configurable media segment duration, as well as a configurable DASH list size for reassembling the media segments at the ingestion server. Because MPEG-DASH 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 configure advanced features like enabling DASH multiplex streaming. You can also assign the MPEG-DASH stream a user name and password.

The following table lists the optional advanced MPEG-DASH parameters. Check with the ingestion server provider to confirm if any of these parameters need to be configured.

Table 51 *Advanced MPEG-DASH parameters*

Item	Description
DASH Multiplex streams	Check this parameter to enable multiplex streams. When enabled, video and audio are sent in the same segment file instead of one segment for audio and a different one for the video.
Embedded initialization segment	Check this parameter to enable inserting an

Item	Description
	embedded initialization segment into this stream. When enabled, initialization data for the stream is embedded in the MPEG DASH MPD file instead of sending it separately.
User-Agent	If the ingestion server requires or only allows incoming streams with specific values in the user-agent header, use this parameter to configure Pearl Nano with the value to insert in its user-agent header.
Initialization template	Use this field to specify the name of the initialization file that Pearl Nano sends to the ingestion server. Check with the ingestion server provider for what value to use.
Media segment template	Use this field to specify the name of the media segment file that Pearl Nano sends to the ingestion server. Check with the ingestion server provider for what value to use.
DASH MPD upload period	Set the duration as an integer in seconds. The acceptable range is from 1 to 999 seconds. The default value is 60 seconds. Fractions and periods are not allowed.

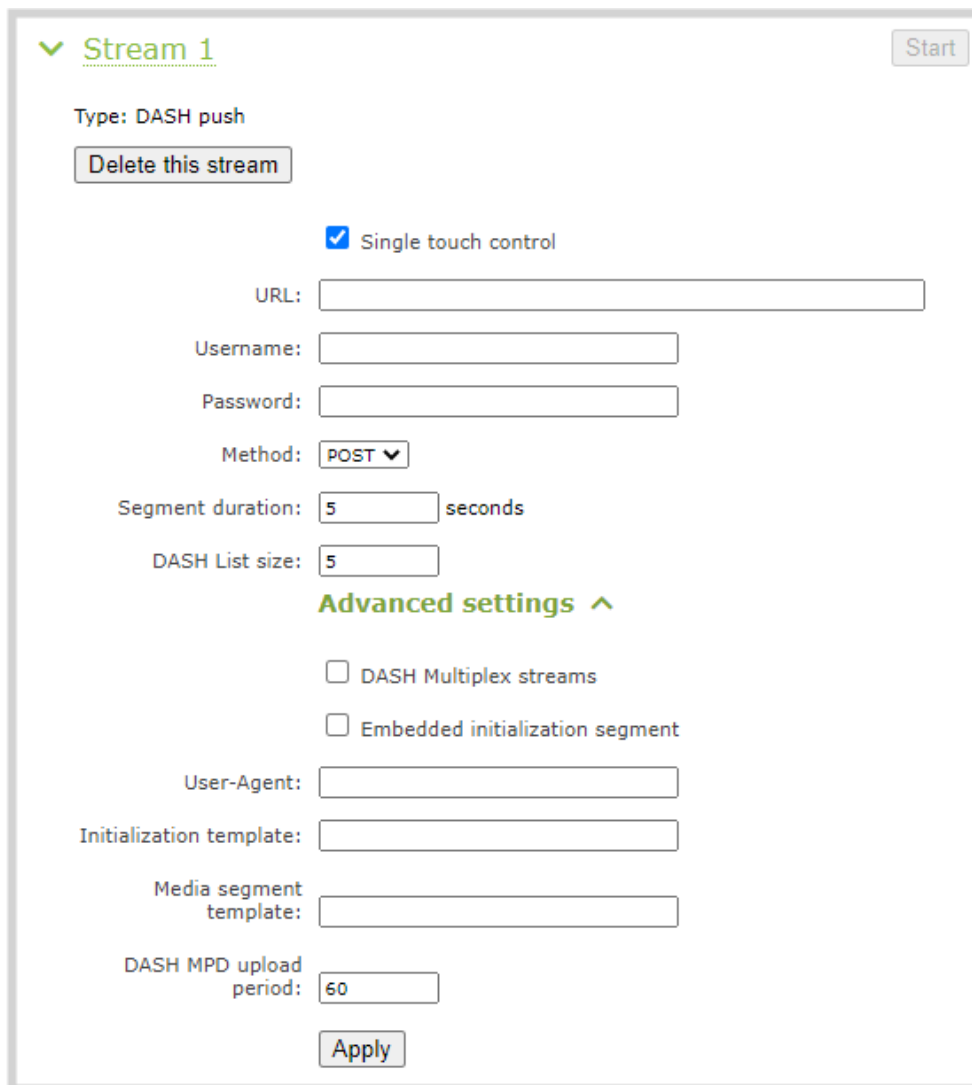
Important considerations

- Only a single resolution and bitrate stream is supported.
- Set H.264 as the video encoding for the channel that's streaming.
- Fragmented MP4 is not supported.
- If the MPEG-DASH 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 MPEG-DASH (push) stream using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.

3. Click **New stream** and choose **DASH push**. The new stream is created using the default name *Stream 1*. To see the settings, click the stream name.



The screenshot shows the configuration page for 'Stream 1'. At the top left is a green checkmark and the text 'Stream 1'. To the right is a 'Start' button. Below this, it says 'Type: DASH push' and there is a 'Delete this stream' button. A checked checkbox labeled 'Single touch control' is present. The form includes several input fields: 'URL:', 'Username:', 'Password:', 'Method:' (with a dropdown menu currently showing 'POST'), 'Segment duration:' (with a value of '5' and the unit 'seconds'), and 'DASH List size:' (with a value of '5'). An 'Advanced settings' section is expanded, showing checkboxes for 'DASH Multiplex streams' and 'Embedded initialization segment', both of which are unchecked. Below these are input fields for 'User-Agent:', 'Initialization template:', and 'Media segment template:'. At the bottom of the advanced settings is 'DASH MPD upload period:' with a value of '60'. An 'Apply' button is located at the very bottom of the form.

4. In the **URL** field, enter the URL of the destination server that is ingesting the stream. For example: *http://p-ep721023.i.akamaientrypoint.net/722223/hlsQualification/my_video.m3u8*
5. (Optional) Enter a **Username** and **Password** if required for this stream. Get this from the ingestion server provider.
6. In the **Method** field, select **POST** or **PUT**. This selection must match the requirements of the ingestion server.
7. In the **Segment duration** field, enter the length of the media segment in seconds. The default duration is five seconds. Fractions and periods are not supported.

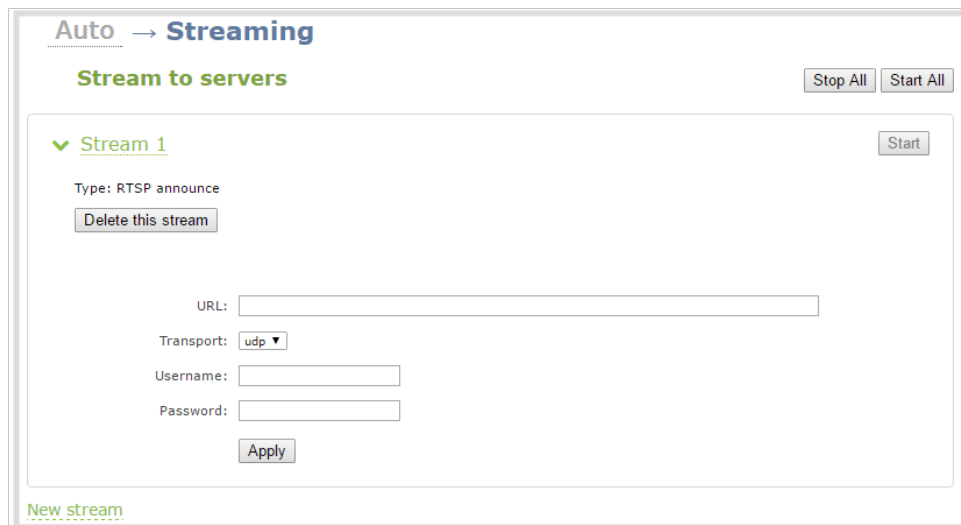
8. In the **DASH List size** field, enter the number of .ts segment files in each segment. The default playlist size is five.
9. (Optional) Under **Advanced settings**, you can set the following:
 - a. Check **DASH Multiplex streams** to enable multiplex streaming.
 - b. Check **Embedded initialization segment** to add an optional initialization segment to the stream.
 - c. **User-agent**: Enter a user-agent name using alphanumerical characters only if the ingestion server requires that to allow the incoming stream from this device.
 - d. **Initialization template**: Enter the address to use for each individual DASH list in the stream. The initialization template also provides the bitrate, resolution, and codec.
 - e. In the **Media segment template** field, enter the naming format used for the names of media segments. For example: *chunk- $\$$ Number%05d\$.ts*
 - f. Enter the **DASH MPD upload period** as an integer in seconds. The default is 60 seconds.
10. Click **Apply**.
11. When you're ready to start streaming this channel, click **Start**.

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 Admin panel](#).
2. From the Channel 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. 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.

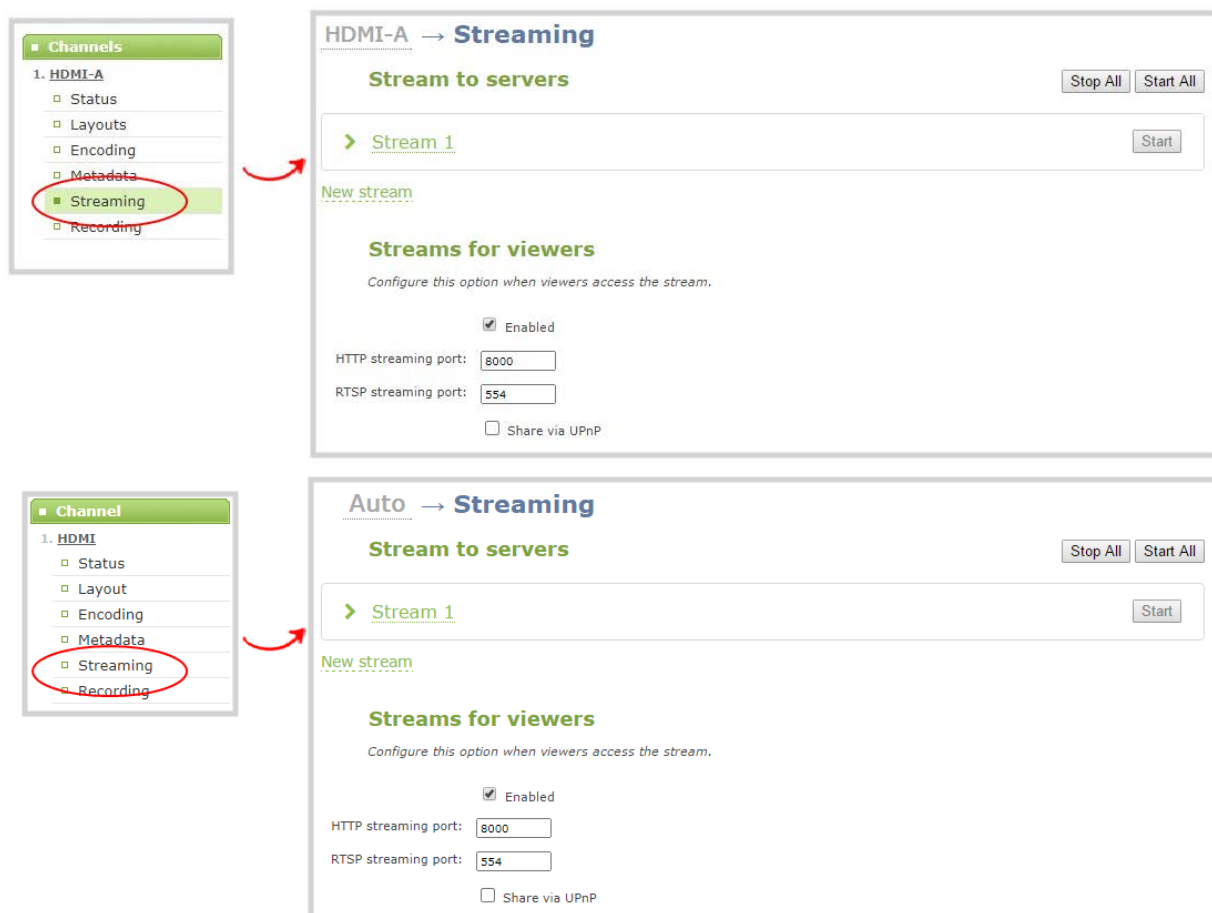
7. Click **Apply**.
8. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
9. Click **Delete this stream** at any time to delete the stream.

Set up a stream to the CDN using an XML profile

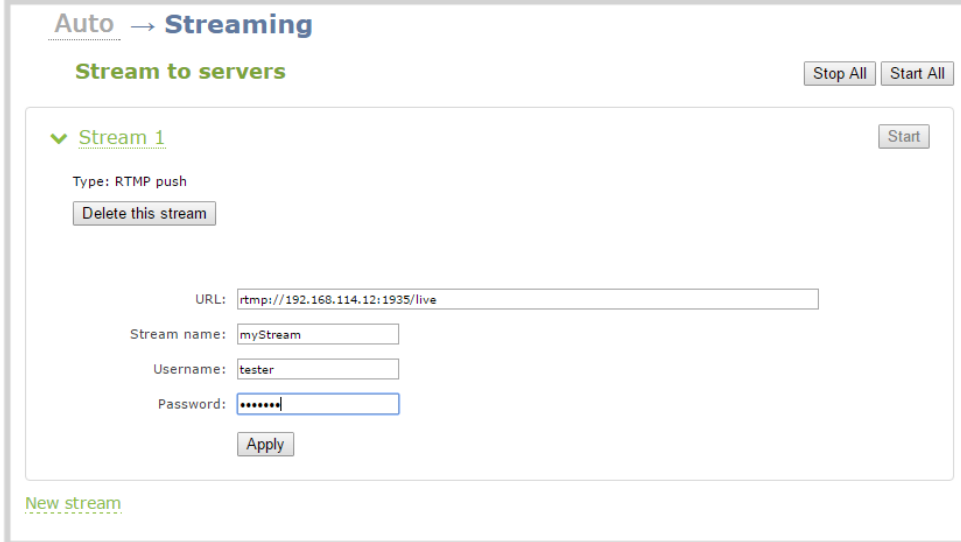
Some CDNs provide an XML file for easy configuration setup. Pearl Nano supports using XML profiles to set a stream.

Set up a stream using an XML profile from the CDN

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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.



Auto → Streaming

Stream to servers Stop All Start All

▼ Stream 1 Start

Type: RTMP push

Delete this stream

URL:

Stream name:

Username:

Password:

Apply

[New stream](#)

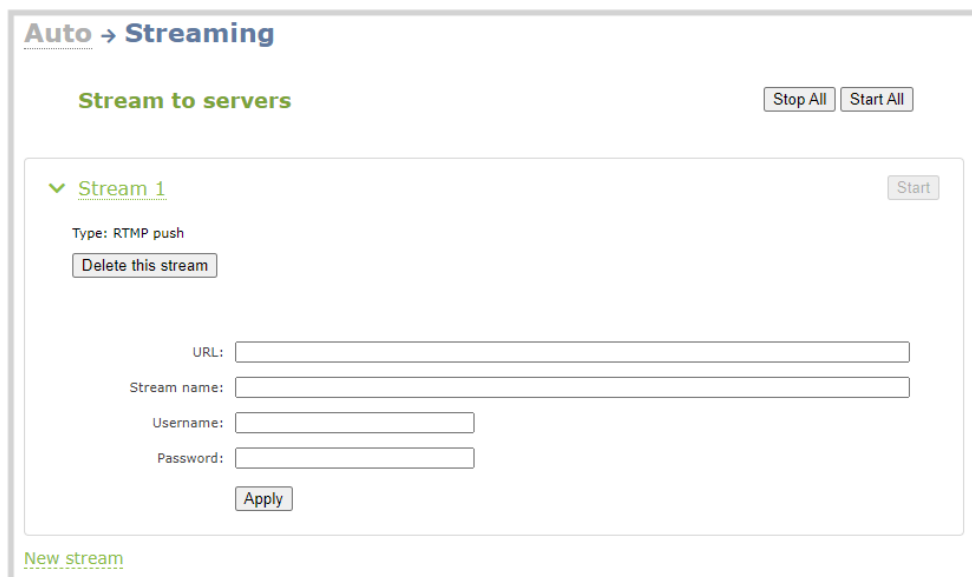
5. Click **Apply**.
6. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
7. Click **Delete this stream** at any time to delete the stream.

Start and stop streaming to a CDN

After your stream to a CDN is configured on the channel, you can start and stop streaming using the Admin panel, the front screen control key interface, or the front screen menu. When you use the front screen menu, you can also modify the URL of a chosen stream.

Start and stop streaming using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel 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.

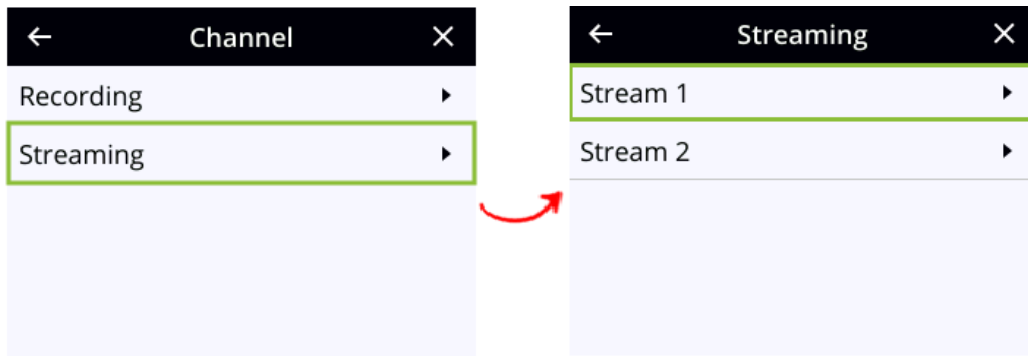
Start and stop streaming using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.

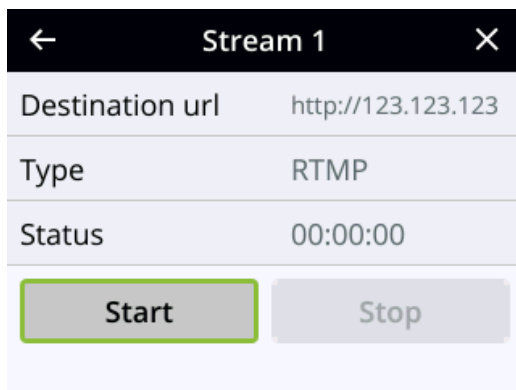


Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

2. Use the arrow and check mark keys to select **Channel**. Then from the Channel screen, select **Streaming** to open the Streaming screen with the list of streams already configured for the channel.



3. Use the arrow and check mark keys to select a stream and open the stream's details screen.

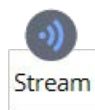


4. From the stream's details screen, use the arrow keys to highlight **Start** and press the **check mark** key start streaming. When you're done, highlight **Stop** and press the **check mark** key to stop streaming.

Before you start the stream, you can select **Destination url** using the check mark key and modify the stream destination's URL.

Start and stop streaming using the Stream control key on the front panel

Simply press the **Stream control key** on Pearl Nano's front panel to easily start and stop streaming a channel. The Stream control key glows solid blue and the streaming timer on the Channel view increments while streaming is in progress. When you're done, press the Record control key again to stop streaming. If multiple streams are configured for the channel, pressing the Stream control key starts and stops all streams at the same time. For more information, see [Record and stream using the control keys](#).



You cannot start streaming using the Stream control key while you are navigating the front screen menu system. Exit the front screen menu and then start streaming using the Stream control key.

Multicast streaming

You can add multiple multicast streams to a channel in Pearl Nano. 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 Nano 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 \(SAP\)](#)

To setup multicast streaming to set-top boxes, digital signs, smart TVs and other digital media players over a local network using UPnP, see [Stream using UPnP](#).

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 Admin panel](#).
2. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and select **MPEG-TS RTP/UDP push**.

Auto → **Streaming**

Stream to servers

▼ **Stream 1** Start

Type: MPEG-TS RTP/UDP push

Destination IP:

Destination port:

SAP announcement

SAP announcement IP:

Channel number:

Group name:

Limit bandwidth:

Limit bandwidth rate: kbits

[New stream](#)

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 Admin panel](#).
3. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.
4. Click **New stream** and select **MPEG-TS UDP push**.

HDMI-B → Streaming

Stream to servers

Stop All Start All

▼ **Stream 1**

Type: MPEG-TS UDP push

Delete this stream

Start

Single touch control

Destination IP:

Destination port:

SAP announcement

SAP announcement IP:

Channel number:

Group name:

Limit bandwidth:

Limit bandwidth rate: kbits

Apply

[New stream](#)

5. 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.

6. Enter the destination port number through which the media will stream.

7. (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.
8. Click **Apply**.
 9. 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 Nano 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 Admin panel](#).
3. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.
4. Click **New stream** and select **RTP/UDP push**.

Auto → **Streaming**

Stream to servers

▼ **Stream 1** Start

Type: RTP/UDP push

[Delete this stream](#)

Destination IP:

Audio port:

Video port:

SAP announcement

SAP announcement IP:

Channel number:

Group name:

Limit bandwidth:

Limit bandwidth rate: kbits

[Apply](#)

[New stream](#)

5. 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.

6. Click **Apply**. An SDP file is generated.
7. From the channel's **Status** page, click the SDP file to download it. Provide the SDP file name and location if prompted.
8. 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 Nano's API, see the Technical Notes for your Pearl Nano model for instructions. They're available from the product resources page on the [Epiphan.com](https://www.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

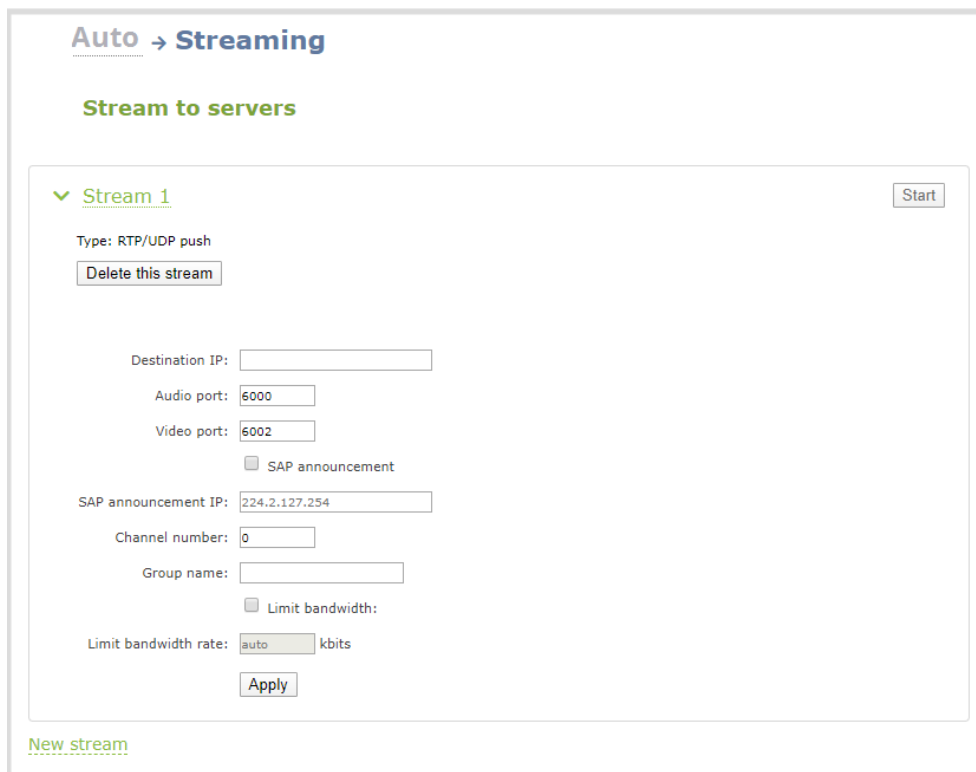
- Traffic shaping works for the local switch. Switches connected to the local switch don't respect the policy.
- If the channel encoding bitrate is set to a value that's less than 4 Mbps and traffic shaping is enabled, the minimum bandwidth limit does not drop below than 4 Mbps.
- If the channel encoding 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 Nano 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 Nano model for instructions. They're available from the product resources page on the [Epiphan.com](https://www.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 Admin panel](#).

2. From the Channel 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.



Auto → **Streaming**

Stream to servers

▼ **Stream 1** Start

Type: RTP/UDP push

[Delete this stream](#)

Destination IP:

Audio port:

Video port:

SAP announcement

SAP announcement IP:

Channel number:

Group name:

Limit bandwidth:

Limit bandwidth rate: kbits

[Apply](#)

[New stream](#)

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 Pearl Nano, the channel identifier is always 1. 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 Announcement 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.




SAP announcement

SAP announcement IP:

Channel number:

Group name:

VLC playlist

Title	Duration	Album
Room #4-15		
 D2P83658.vga		
 D2P83658.video		
 REC95091		

Streaming to a media player or smart TV

Your Pearl Nano can use UPnP and SAP to stream to set-top boxes, digital signs, smart TVs and other digital media players.

The following table gives an overview of each option.

Publishing Options	Use this option to...
UPnP	Using the Universal Plug and Play (UPnP) networking protocol, your Pearl Nano can be discovered and can stream to software and hardware media players, set-top boxes and Smart TVs with ease. See Stream using UPnP .
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.

Stream using UPnP

Using the Universal Plug and Play (UPnP) networking protocol, Pearl Nano can be discovered and can stream to software and hardware media players, set-top boxes, and Smart TVs with ease. When UPnP is enabled, Pearl Nano automatically establishes communication with media players on the network.

UPnP uses MPEG-TS over HTTP with the H.264 codec and MP3 or AAC audio encoding (or no audio). You can only access live streams or recordings that meet these requirements.

For security reasons, UPnP access to live streams and recorded files is disabled by default.



Some players cannot access the stream or saved recordings if a viewer password is set. See **User administration** to remove the viewer password if set.

Topics include:

- [Enable UPnP](#)
- [Disable UPnP](#)
- [Viewing with UPnP](#)
- [Change UPnP device name](#)

Enable UPnP

For security reasons, UPnP is disabled for Pearl Nano at the device level and for each channel by default. You can enable UPnP to allow digital media players on the network to browse for recorded media files or live streams on your Pearl Nano.

There are two steps to enable UPnP on Pearl Nano:

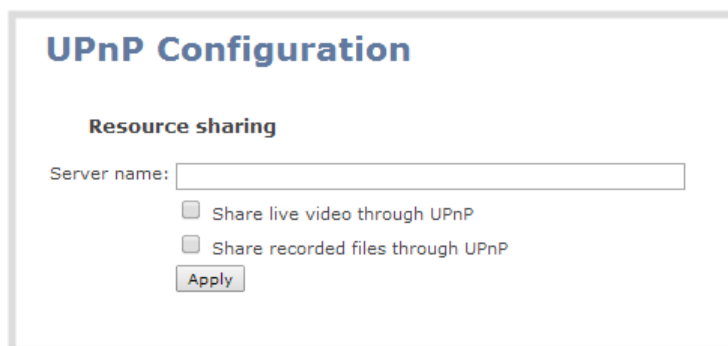
- Enable UPnP at the device level (including setting a share name)
- Enable UPnP for the channel



Streams and MPEG-TS recorded files must use the supported codecs: H.264 with MP3 or AAC audio. Having a viewer password could prevent the ability to use UPnP.

Enable UPnP for the device using the Admin panel

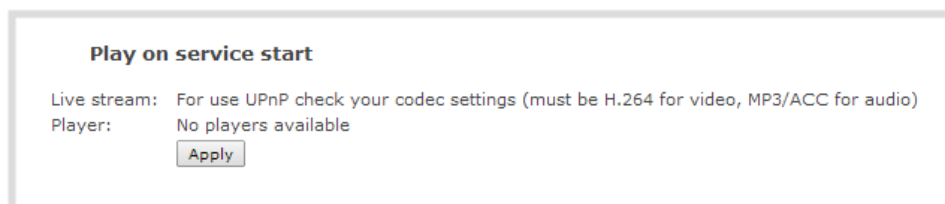
1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
3. From the Configuration menu, click **UPnP**. The UPnP configuration page opens.



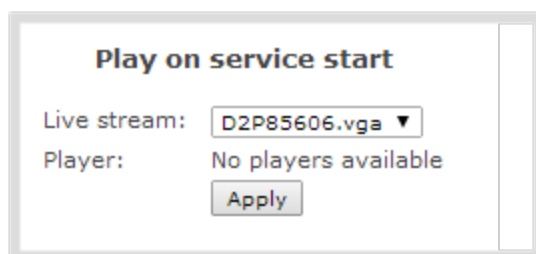
The screenshot shows the 'UPnP Configuration' page. Under the heading 'Resource sharing', there is a text input field for 'Server name:'. Below this field are two checkboxes: 'Share live video through UPnP' and 'Share recorded files through UPnP'. At the bottom of the configuration area is an 'Apply' button.

4. Enter a name in the **Server name** field. If no name is provided the server name will be the serial number of Pearl Nano.
5. Select whether you want to share live video and recorded files and click **Apply**.

If no live stream is available that meets the criteria for UPnP, a message is displayed in the **Play on service start** section of the page.



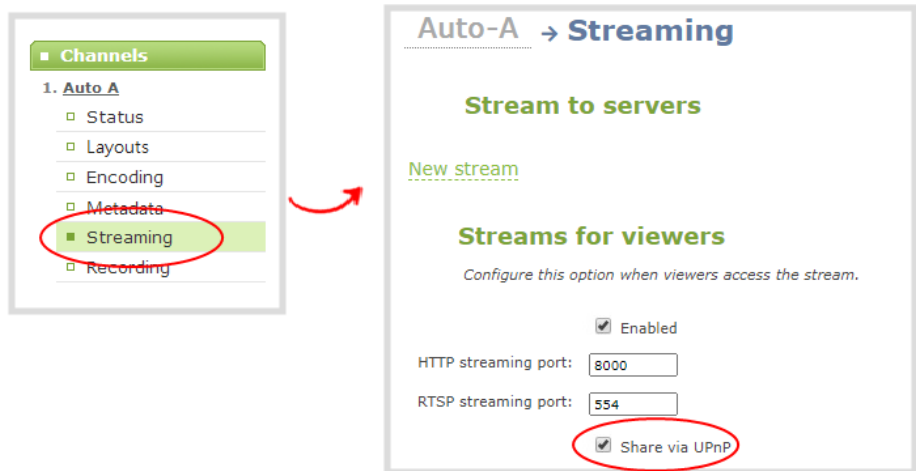
Otherwise, the Play on service start section shows a drop-down list of what can be streamed.



Enable UPnP for a channel using the Admin panel

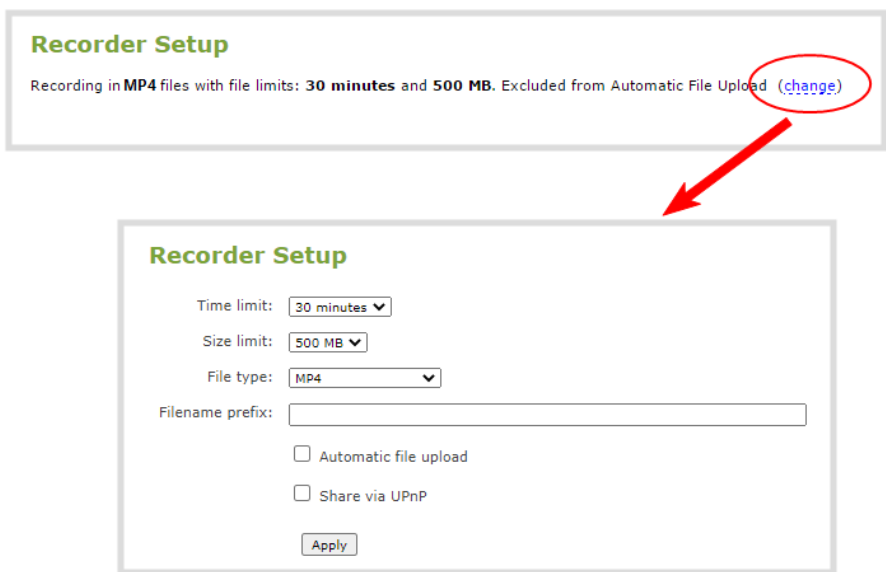
After you enable UPnP for the device to allow live stream and recorded file sharing, you need to enable sharing for the channel.

1. For a channel you are live streaming, do the following:
 - a. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.
 - b. Check **Share via UPnP** and click **Apply**. You can now browse for your server from your digital media player.



If you have not already enabled UPnP for the device, the message "UPnP live video sharing is not enabled with this device, to fix it, click here" appears. Click **to fix it click here**. The UPnP service will start when you click **Apply**.

2. For a channel you are recording, do the following:
 - a. From the Channel menu, select the channel and click **Recording**. The channel's recording page opens.
 - b. Click **change** under Recorder Setup. The recording setup options opens.



- c. Check **Share via UPnP** and click **Apply**. You can now browse for your server from your digital media player.

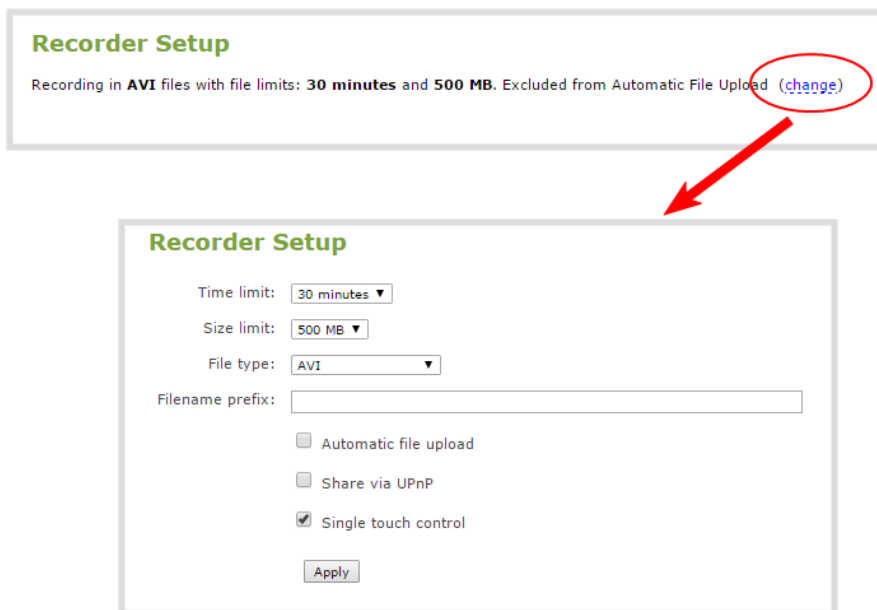
If you have not already enabled UPnP for the device, the message "UPnP live video sharing is not enabled with this device, to fix it, click here" appears. Click **to fix it click here**. The UPnP service will start when you click **Apply**.

Disable UPnP

By default, UPnP sharing is disabled for the device, as well as for the channel. After the UPnP broadcast is finished, you may want to disable UPnP sharing for security. You can disable UPnP access for a channel's live stream, recordings, or for the whole system.

Disable UPnP for a channel using the Admin panel

1. For the channel's live streams, do the following:
 - a. From the Channel menu, select the channel and click **Streaming**. The Streaming configuration page opens.
 - b. Uncheck **Share via UPnP** and click **Apply**.
2. For the channel's recordings, do the following:
 - a. From the Channel menu, select the channel and click **Recording**. The channel's recording page opens.
 - b. Click **change** under Recorder Setup. The recording setup options opens.
 - c. Uncheck **Share via UPnP** and click **Apply**.




Disable UPnP globally for the device using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
3. From the Configuration menu, click **UPnP**. The UPnP configuration page opens.
4. Uncheck **Share live video through UPnP** to stop sharing live video.
5. Uncheck **Share recorded files through UPnP** to stop sharing recorded files.
6. Click **Apply**.

Viewing with UPnP

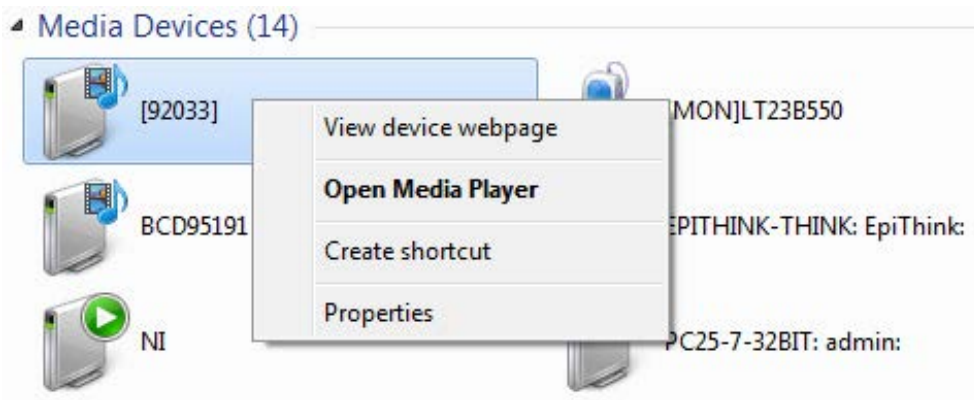
Using a software or hardware media player, you can browse for files or streams with Universal Plug and Play (UPnP). UPnP uses MPEG-TS over HTTP with the H.264 codec and MP3 or AAC audio encoding (or no audio). You can only access live streams or recordings that meet these requirements.

For security reasons, UPnP access to live streams and recorded files is disabled by default. To enable UPnP, see [Enable UPnP](#)

 Some players cannot access the stream or saved recordings if a viewer password is set. If needed, see **Remove user passwords** to clear the viewer password.

When browsing via UPnP your Pearl Nano is displayed by the server name you set, or it's product serial number.

For example, when browsing from a Windows computer, you will see a list of media devices that includes Pearl Nano:



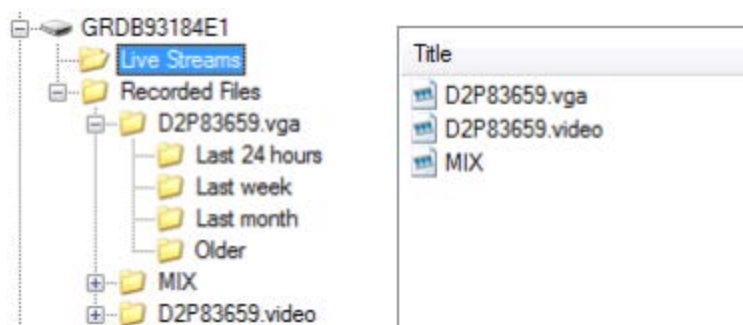
Live streams

When you open the device from Windows Media Player, you'll see a list of the available channels you can stream under the Videos tab. From other digital media players, the channel list can be under a **Live Streams** folder.

With Windows Media Player, double click to open any channel and press Play to start the stream. Using your digital media player, select a live stream and press play.

Recorded files

Recorded files are shown in the Recorded Files folder. Files are organized by the channel or recorder from which they were recorded. Windows Media Player shows the recorder files side by side with the channels and other digital media players show the recorded files in a file tree format, see below.



For information on how to stream UPnP, see [Stream using UPnP](#).

Change UPnP device name

You can configure the UPnP server name that appears for your Pearl Nano. By default, if you leave the server name field blank when enabling UPnP, the device's serial number is used as the server name.

Change the UPnP server name using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
3. From the Configuration menu, click **UPnP**. The UPnP configuration page opens.
4. In the **Server name** field, type a new server name. Use characters A-Z, a-z, 0-9, _ , : , @ , ^ , # , - , { } , [] , () .
5. Click **Apply**.

PART 4: Record

You can stream your content and record it at the same time. Pearl Nano encodes the video and audio it captures.

There are different ways to download recordings, like automatically downloading recordings to a USB memory device. For Pearl Nano, an SD card or a SATA M.2 2280 SSD must be installed to record content, see [SD card and SATA M.2 2280 SSD storage](#).

Topics include:

- [About recording](#)
- [Record a channel](#)
- [Configure recording settings, file size and type](#)
- [Restart recording to a new file](#)
- [Manage recorded files](#)
- [FTP and automatic file transfers](#)
- [Local FTP server](#)

For instructions on how to use Pearl Nano's front screen to start/stop scheduled recordings for a CMS event, see [Stop/start scheduled CMS events using the front screen menu](#).

For information about recording with Content Management Systems (CMSs) like Kaltura and Panopto, see [CMS recording and webcasting control on Pearl Nano](#).

About recording

You can record a channel on Pearl Nano as AVI, MOV, MPEG-TS, MP4, or MP4-Fragmented. Easily stop and start recording using any of the local user interfaces as well as remotely:

- Admin panel
- Front panel control keys
- Epiphan Cloud

Pearl Nano also comes with APIs so you can setup third party tools to control recording, see the [Pearl System API Guide](#) for details.

Recording using Pearl Nano is robust. If an accidental system shutdown occurs while recording is in progress, your recordings are gracefully 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. 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.



If PoE+ power is interrupted while Pearl Nano is actively recording, the recorded file could become corrupted and be unplayable.

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

- While actively recording a channel that includes a layout with multiple video input sources, a new file is created if an additional video input source is added to the channel.
- An SD card or a SATA M.2 2280 SSD must be installed to record, see [SD card and SATA M.2 2280 SSD storage](#).
- After an SD card is formatted using Pearl Nano, do not manually change the default file folder structure on the SD card.
- Ejecting the SD card while the recording is in progress may corrupt the SD card and cause loss of data. Power down Pearl Nano before ejecting the SD card. Stop all recording before powering down the system.



- The maximum file size cannot be larger than a quarter of the total available space on the SD card. For example, the maximum file size limit for a 64 GB SD card is 16 GB. A warning appears if you set a file size limit that is bigger than a quarter of the SD card capacity.
- If you set the file size limit and then swap in a smaller SD card, you must change the file size limit to a smaller size using the Admin panel if the file size limit is bigger than the SD card.
- Recording with a file size limit that exceeds the size of the SD card will corrupt the SD card.
- Newer recordings overwrite oldest recordings when the amount of free space on the SD card (or M.2 SSD) is less than the configured recording file size limit.
- 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 SD card (or M.2 SSD), new recordings fail and do not overwrite recordings in the AFU queue.
- The SD card is formatted for Ubuntu systems and is not compatible with Windows and Mac devices. To download recordings, see [Manage recorded files](#).
- We recommend using large capacity SD cards such as 256 GB or a large capacity M.2 SSD when using Pearl Nano with a CMS. Do not schedule recordings that are longer than the capacity of Pearl Nano to store the recording to the storage medium.

For information about recording to Content Management Systems (CMSs) like Kaltura and Panopto, see [CMS recording and webcasting control on Pearl Nano](#). For instructions on how to use Pearl Nano's front screen to start/stop scheduled recordings for a CMS event, see [Stop/start scheduled CMS events using the front screen menu](#).

Tested media players

Epiphan has tested recordings with the following players. See [Troubleshooting Quick Reference](#) for known player issues.

Table 52 *Tested Media Players*

Operating System	Tested Players
Mac OS	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • QuickTime 7.6.6+



Operating System	Tested Players
	<ul style="list-style-type: none">• VLC 2.2.6• Windows Media player 12+• Movies & TV (Windows 10)• Adobe Premiere Pro CC 2015
Linux	<ul style="list-style-type: none">• MPlayer• VLC 2.2.2
HTML 5 Browsers (Windows)	<ul style="list-style-type: none">• Google Chrome 37+ (works with MOV and MP4 files using H.264 codec)

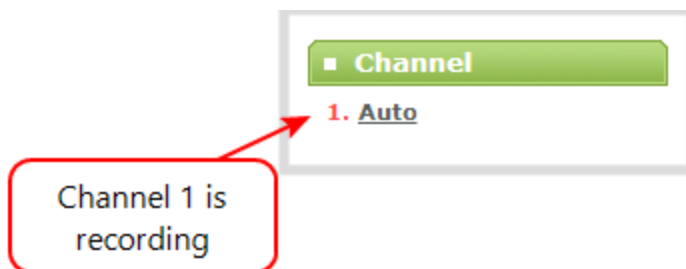


Not all media players and editors support all recording formats, such as the more modern MP4-fragmented format. To playback MOV files created by Pearl Nano, we recommend using a newer media player.

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 the Record control key on the front panel of Pearl Nano, or another interface like Epiphan Cloud.

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.

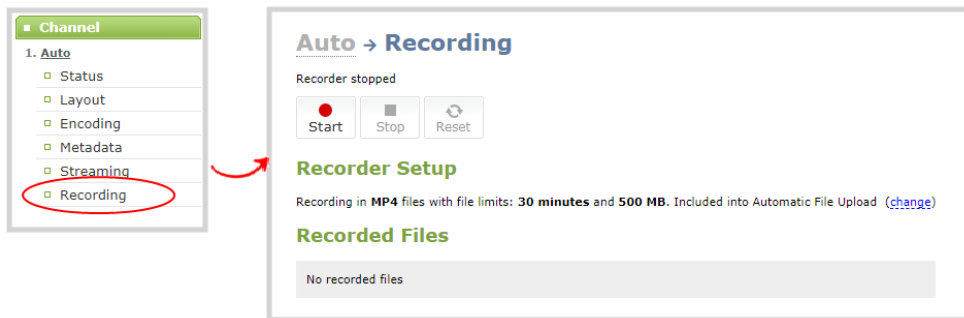


If PoE+ power is interrupted while Pearl Nano is actively recording, the recorded file could become corrupted and be unplayable.

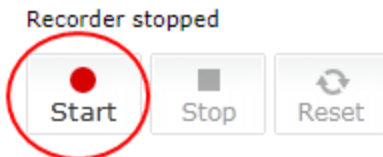
Start and stop recording using the Admin panel




1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Channel 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. Check your inputs to ensure signals are working as expected.

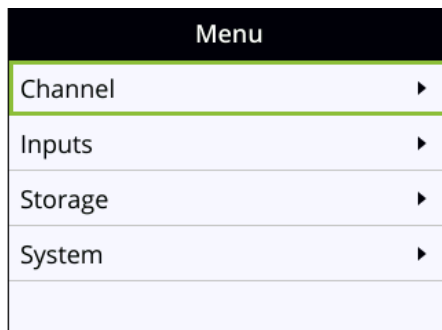
Start and stop recording using the Record control key on the front panel

Simply press the **Record control key** on Pearl Nano's front panel to easily start and stop recording a channel. The Record control key glows solid red and the recording timer on the Channel view increments while recording is in progress. When you're done, press the Record control key again to stop recording. For more information, see [Record and stream using the control keys](#).

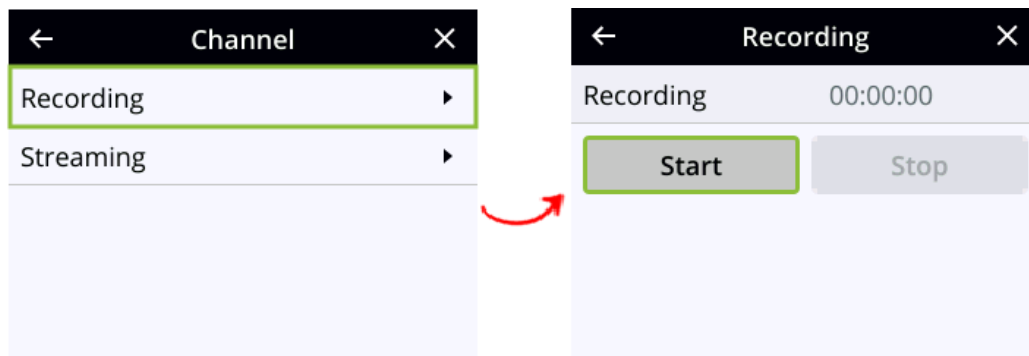


Start and stop recording using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **Channel**. Then from the Channel screen, select **Recording** to open the Recording screen.



3. From the Recording screen, use the arrow keys to highlight **Start** and press the **check mark** key start recording. When you're done, highlight **Stop** and press the **check mark** key to stop recording.




You cannot start recording using the Record control key while you are navigating the front screen menu system. Exit the front screen menu and then start recording using the Record control key.

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.



Tip: 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

- The maximum file size cannot be larger than a quarter of the total available space on the SD card. For example, the maximum file size limit for a 64 GB SD card is 16 GB. A warning appears if you set a file size limit that is bigger than a quarter of the SD card capacity.
- If you set the file size limit and then swap in a smaller SD card, you must change the file size limit to a smaller size using the Admin panel if the file size limit is bigger than the SD card.
- Recording with a file size limit that exceeds the size of the SD card will corrupt the SD card.
- Newer recordings overwrite oldest recordings when the amount of free space on the SD card is less than the configured recording file size limit.
- 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 Cloud must be set to MP4 and the maximum file size supported is 500 MB.

The following table describes the recordings configuration settings.

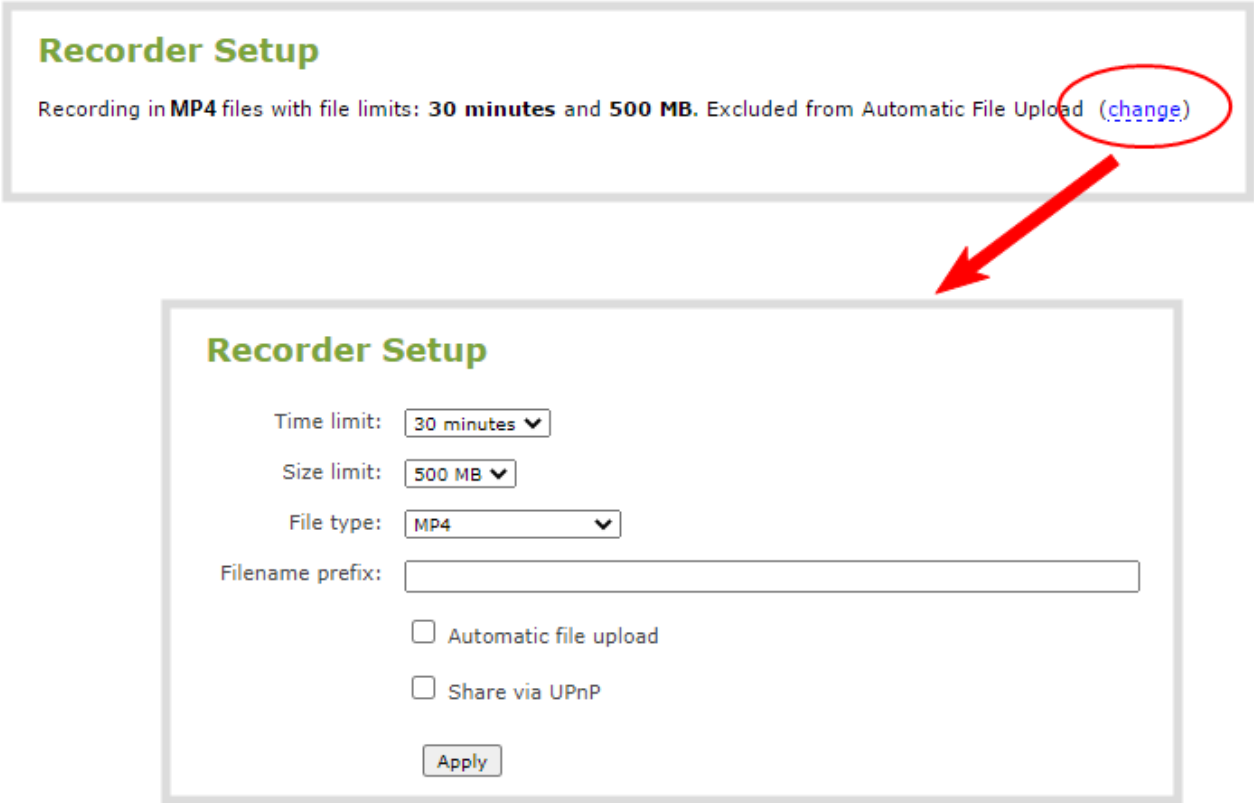
Table 53 Recordings Configuration Settings

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.
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). Values depend on the size of SD card or SATA M.2 2280 SSD installed. The limit maximum is 64 GB.
File type	<p>Specifies the recording file type. Select from AVI, MP4, MP4-Fragmented, MPEG-TS, or MOV. Choose MPEG-TS for UPnP playback.</p> <ul style="list-style-type: none"> • AVI: Generally used for playback on Windows. • 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.

Label	Description / Options
	<div style="border: 1px solid #ccc; padding: 10px; margin-bottom: 10px;">  <p>If power is lost while recording is 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.</p> </div> <ul style="list-style-type: none"> • 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: Choose for UPnP playback. 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	<p>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, _ , #, -, [], ().</p> <p>Avoid using spaces in recording file names. Use underscores or hyphens to separate words instead.</p>
Automatic file upload	<p>Select this if you want this channel or recorder to be part of any scheduled automatic uploads. See FTP and automatic file transfers for information on automatic uploads.</p>
Share via UPnP	<p>Select this if you want this channel or recorder to be available via UPnP. If global UPnP is not enabled when you select this option, a link appears to let you to fix it.</p>

Change the recording configuration using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.
3. Click **change** under Recorder Setup. The recorder settings open.



4. Change the default recording file settings.
 - **Time limit:** Select a value from 5 minutes to unlimited.
 - **Size limit:** Select a value from the listed options. The range depends on the size of the SD card or M.2 SSD installed in Pearl Nano.
 - **File type:** AVI, MPEG-TS, MOV, MP4, or MP4-Fragmented.
5. (Optional) Enter a prefix for the recordings. All new recorded files for this channel or recorder will be prefixed using the text you enter.
6. (Optional) Check the check box to exclude this channel from automatic file uploads, see [FTP and automatic file transfers](#).
7. Click **Apply**.

Restart recording to a new file

Recordings are automatically saved to a file and a new recording is started when:

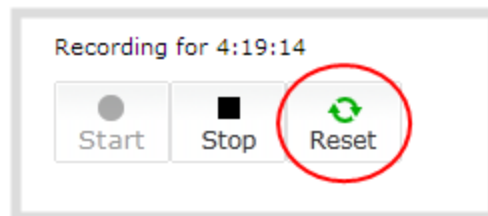
- The recording reaches the configured time or size limit.
- The channel name is changed.

- 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 Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.



3. Select **Reset** to stop the current recording and start a new recording.
4. Refresh the page to see the updated list of recordings.

Manage recorded files

Recordings are saved to the installed SD card or SATA M.2 2280 SSD by default. When the SD card is full, new recordings overwrite the oldest recordings. You can not manually transfer recordings off the SD card to iOS or Windows systems.

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.

Topics include:

- [View list of recorded files](#)
- [Download recorded files manually](#)
- [Join recorded files together](#)
- [Rename recorded files](#)
- [Delete recorded files](#)

For information about automatic file transfers or setting up Pearl Nano as a local FTP server so you can manually or automatically connect to the system and download recordings, see [FTP and automatic file transfers](#).





















View list of recorded files

You can view all the recordings for the channel using the Admin panel.

View the recordings for a channel using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.
3. All recordings are listed and sorted by date.

Recorded Files

	File Name	Start	End	Duration	File Size	
Jun 5	HDMI-A_Jun05_09-58-47.mp4	09:58:47	09:58:47	0 seconds	0.00 MB	
	...					
<input type="checkbox"/>	HDMI-A_May23_10-12-05.mp4	10:12:05	10:12:06	1 seconds	0.00 MB	   
<input type="checkbox"/>	HDMI-A_May23_10-11-36.mp4	10:11:36	10:11:36	0 seconds	0.00 MB	   
	...					
<input type="checkbox"/>	HDMI-A_May23_08-05-11.mp4	08:05:11	08:16:58	11m 47s	499.25 MB	   
<input type="checkbox"/>	HDMI-A_May23_07-53-24.mp4	07:53:24	08:05:11	11m 47s	499.25 MB	   
	...					
<input type="checkbox"/>	HDMI-A_May23_07-29-50.mp4	07:29:50	07:41:37	11m 47s	499.25 MB	   

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

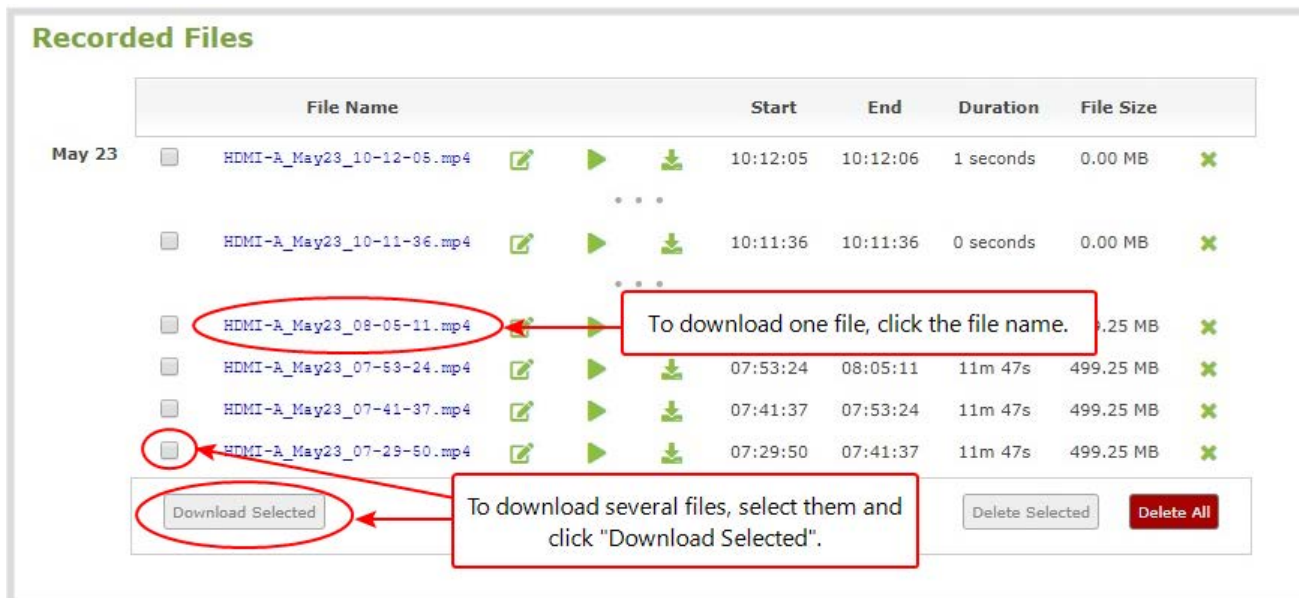
You can manually download recordings using the Admin panel. Files you download are saved to your connected admin computer.



This feature is not available using the local console on Pearl Nano.

Download recordings to your admin computer using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.



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 Nano, see [Delete recorded files](#).

Join recorded files together

After recording files on Pearl Nano, 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 Nano 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 desynchronization can occur between the clips.

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 Nano 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. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.
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 and delete those, or you can delete all recordings for the channel.

 Deleted recordings cannot be recovered.

Delete recordings using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.

Recorded Files

	File Name	Start	End	Duration	File Size	
May 23	<input type="checkbox"/> HDMI-A_May23_10-12-06.mp4					   10:12:05 10:12:06 1 seconds 0.00 MB 
	...					
	<input type="checkbox"/> HDMI-A_May23_10-11-36.mp4					   10:11:36 10:11:36 0 seconds 0.00 MB 
	...					
	<input type="checkbox"/> HDMI-A_May23_08-05-11.mp4	08				  
	<input type="checkbox"/> HDMI-A_May23_07-53-24.mp4	07:53:24	08:05:11	11m 47s	499.25 MB	   
	<input checked="" type="checkbox"/> HDMI-A_May23_07-41-37.mp4	07:41:37	07:53:24	11m 47s	499.25 MB	   
	<input type="checkbox"/> HDMI-A_May23_07-29-50.mp4	07:29:50	07:41:37	11m 47s	499.25 MB	   

To delete files, select them and click "Delete Selected".

To delete all files, click "Delete All".

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, 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).

FTP and automatic file transfers

Pearl Nano can be configured to automatically upload recordings from local storage to a network storage location or an attached USB drive. We call this 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. You can also configure Pearl Nano to act as an FTP server, allowing you to manually or automatically connect to Pearl Nano and download recordings.

Topics include:

- [About Automatic File Upload \(AFU\)](#)
- [Configure AFU to FTP server parameters](#)
- [Set the channel to include in AFU](#)
- [Add recordings to an AFU queue](#)
- [Enable AFU, schedule, and set options](#)
- [Configure AFU to FTP server parameters](#)
- [Configure AFU to RSync server parameters](#)
- [Configure AFU to CIFS server parameters](#)
- [Configure AFU to SCP client parameters](#)
- [Configure AFU to SFTP server parameters](#)
- [Configure AFU to AWS S3 parameters](#)
- [Configure AFU to WebDav server parameters](#)
- [AFU or copy to USB](#)
- [Local FTP server](#)

To view and manage the USB file transfer queue, manage the AFU queue, and view the AFU upload logs:

- [Manage USB file transfer queue](#)
- [Add recordings to an AFU queue](#)
- [View the AFU log](#)
- [Manage the AFU queue](#)
- [View AFU and file transfer progress](#)

About Automatic File Upload (AFU)

Pearl Nano can automatically upload recorded files from the channel 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 name.
- Save recordings to a folder that's labeled using Pearl Nano's serial number.

Automatic File Upload (AFU) is not enabled by default. You must enable this feature for a channel 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
- RSync
- CIFS
- CP
- SFTP
- Amazon Web Server (AWS)
- WebDav
- USB Drive

Important considerations

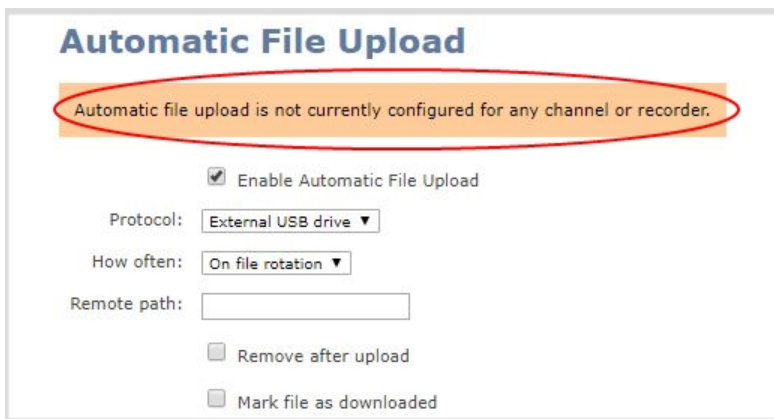
- Only **one** type of AFU can be used for all file transfers from the same channel.
- Automatic File Upload (AFU) is not available while Content Management System (CMS) is enabled Pearl Nano.
- Files are automatically uploaded only once. New recordings created during later sessions do not overwrite 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 in the SD card (or M.2 SSD), new recordings fail and do not overwrite recordings in the AFU queue.

Set the channel to include in AFU

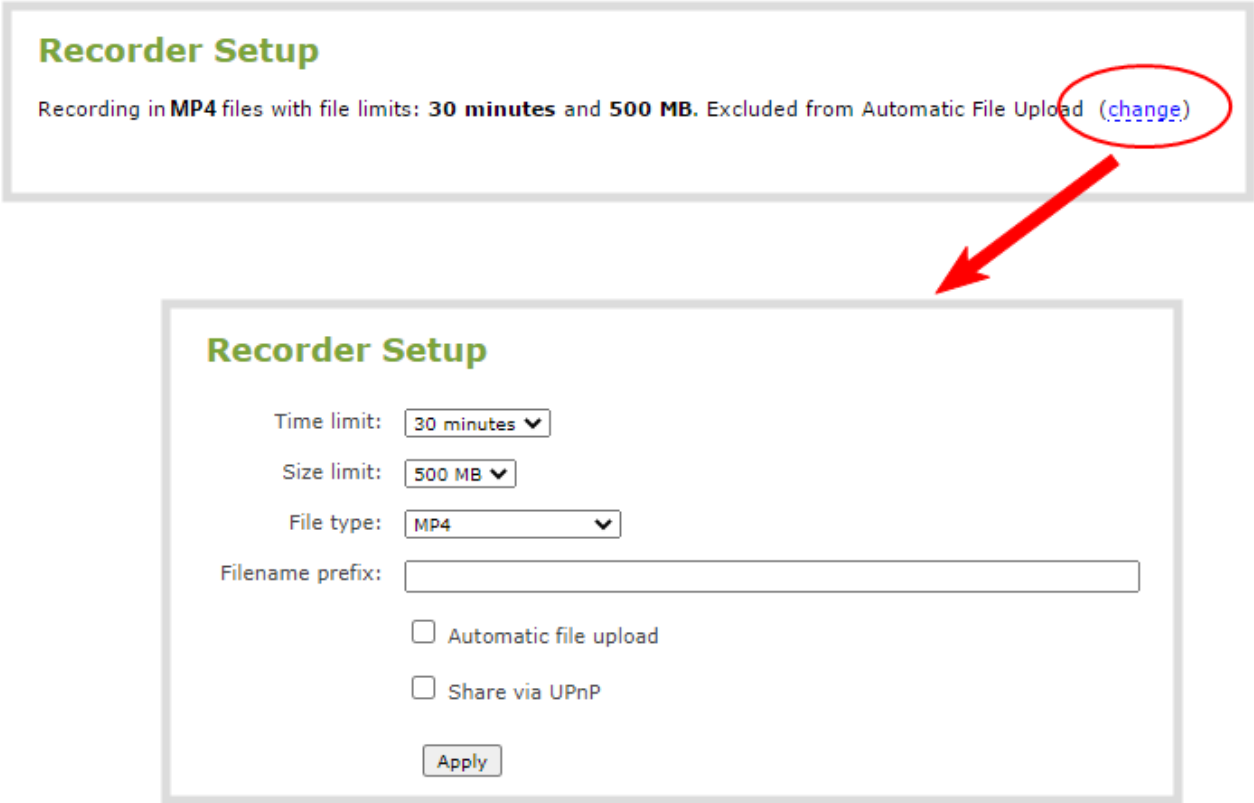
When configuring automatic file upload (AFU), you need to tell the system which channels and recorders you want included in the upload schedule. If no channels or recorders are configured as a part of AFU, the following message appears in the Automatic File Upload configuration page.

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 the channel to include in the AFU schedule using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Channel menu, select **Recording**. The Recording page opens.
3. Click **change** under Recorder Setup. The recorder settings open.



4. Check **Automatic file upload** and click **Apply**.

What's Next


After you've enabled AFU for your channel, enable AFU and configure the AFU settings for the location type (i.e. FTP, USB, AWS, etc).

Enable AFU, schedule, and set options

You can enable Automatic File Upload (AFU) and schedule when and where you want the recorded files to upload using the Admin panel.

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.

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. You can manually transfer those recordings, see **Download recorded files manually**.

The following table describes the AFU options.

Table 54 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 Nano 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. Use either the channel or recorder name.
Create a subfolder for device	Save the downloaded files into a folder using the serial number of Pearl Nano.

Enable AFU and set a schedule or AFU options usig the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Automatic File Upload**. The Automatic File Upload configuration page opens.

Automatic File Upload

Enabled for: **Channel 1, My Program**

Settings

Enable Automatic File Upload

Protocol: External USB drive ▼

Remote path:

Remove after upload

Mark file as downloaded

Create a subfolder for each channel

Create a subfolder for device (TSG700558)

File upload schedule


Start upload: 08:00 ▼

Stop upload: 18:00 ▼

[Show log of automatic file upload](#)

External USB drive

Apply

 If your screen does not indicate that AFU is enabled for at least one channel or recorder, return to **Set the channel 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.

File upload schedule

Start upload:

Stop upload:

7. Click **Apply**.

 If AFU to your server fails, check the server configuration and permissions.

What's next?

Select the protocol transfer type and configure the protocol settings. Do one of the following:

- [Configure AFU to FTP server parameters](#)
- [Configure AFU to RSync server parameters](#)
- [Configure AFU to CIFS server parameters](#)
- [Configure AFU to SCP client parameters](#)
- [Configure AFU to SFTP server parameters](#)
- [Configure AFU to AWS S3 parameters](#)
- [Configure AFU to WebDav server parameters](#)
- [AFU or copy to USB](#)

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 55 *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.

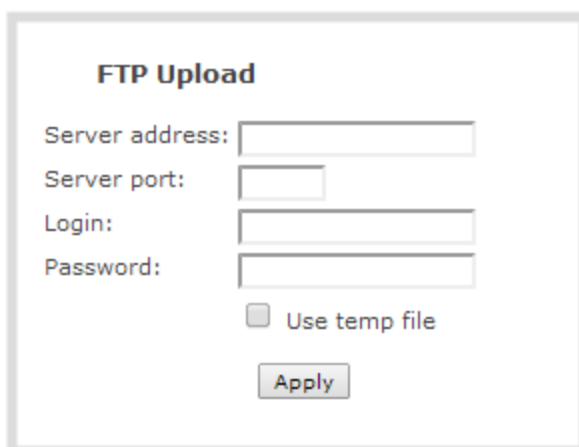
Name	Description
Password	Password for the FTP user.
Use temp file	Causes files to be named with .part extension on the server during active upload. When the upload completes, the file is renamed to the appropriate extension (.mov, .mp4 or .avi).

Prerequisites

- The channel is already added for AFU, see [Set the channel 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 56 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

- The channel is already added for AFU, see [Set the channel 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.

SFTP Upload

Server address:


Server port:

Login:

Password:

Use temp file


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 your Pearl Nano. 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 57 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.



Name	Description
Password	Password for the RSync user.
Checksum	Select to enable checksum checking during file transfer. This increases the time taken to transfer, but also increases reliability of the transfer.

Prerequisites

- The channel is already added for AFU, see [Set the channel 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. Samba version 1 is supported.

The following table describes the parameters to configure AFU to a CIFS server.

Table 58 CIFS Automatic File Upload Configuration Parameters

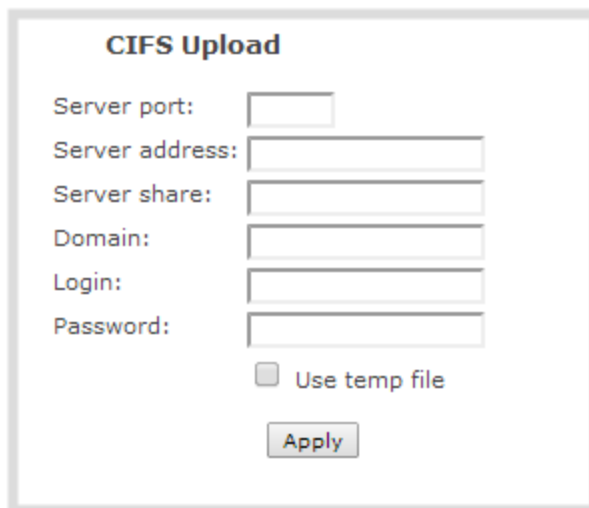
Name	Description
Server Port	The CIFS server port. Leave blank to use the default port, or enter the port used for your CIFS server.
Server address	The IP address (or fully qualified domain name) of the CIFS server.
Server share	The name of the shared folder on the CIFS server.
Domain	The CIFS server's 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

- The channel is already added for AFU, see [Set the channel 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 59 SCP Automatic Upload Configuration Parameters

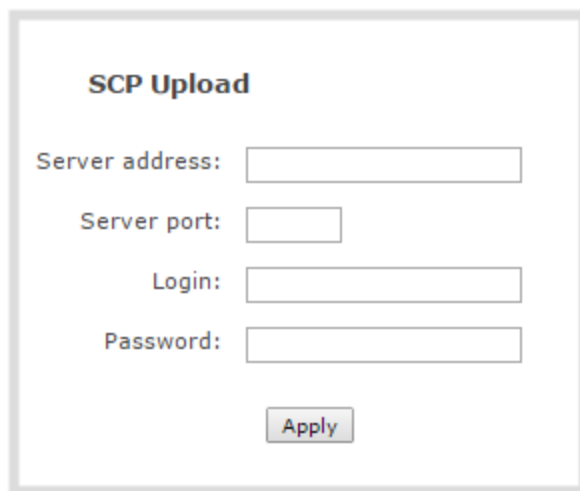
Name	Description
Server address	The IP address (or fully qualified domain name) of the destination server.
Server port	The SCP port used by the target server. Standard port is 22.
Login	Username for the SCP server.
Password	Password for the SCP user.

Prerequisites

- The channel is already added for AFU, see [Set the channel to include in AFU](#).
- AFU is enabled and the parameters configured, see [Enable AFU, schedule, and set options](#).

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.



SCP Upload

Server address:

Server port:

Login:


Password:

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 Nano. 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 60 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, i.e. GAKSOSIFDONN2EXAMPLE.
Secret Access Key	The secret access key is part of your access key for your AWS account, 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.
- The channel is already added for AFU, see [Set the channel 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.

AWS S3 Upload

AWS Region Code:

 Bucket:

 Access Key Id:

Secret Access Key:

 Session Token:



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.
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 61 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

- The channel is already added for AFU, see [Set the channel 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.

WebDAV Upload

Server address:

Server port:

Login:

Password:

Enable HTTPS

Use temp file

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

Pearl Nano has a USB 3.0 port that you can use to copy recordings from the SD card (or the SATA M.2 2280 SSD if installed) to an external USB flash drive or hard drive. This is a quick and convenient way to give people a copy of the recorded session before they leave the venue.

The USB storage device must be formatted with one of the following file systems:

- FAT16
- FAT32
- XFS
- EXT2
- EXT3
- EXT4
- NTFS

We do not recommend using a USB hub to connect more than one USB device to Pearl Nano at a time for file transfers. Only one copy or move to USB operation is permitted at a time.

Topics include:

- [AFU to a USB storage device](#)
- [Do a one-time copy/move all recordings to USB storage device](#)
- [Manually copy recordings to a USB storage device](#)
- [View file transfer status and cancel file copy to a USB device](#)
- [View available USB storage space](#)
- [Safely eject USB storage device](#)

To view AFU and monitor file transfer progress, see [View AFU and file transfer progress](#).

AFU to a USB storage device

You can 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.

A USB ports is available on the back panel of Pearl Nano.

Prerequisites

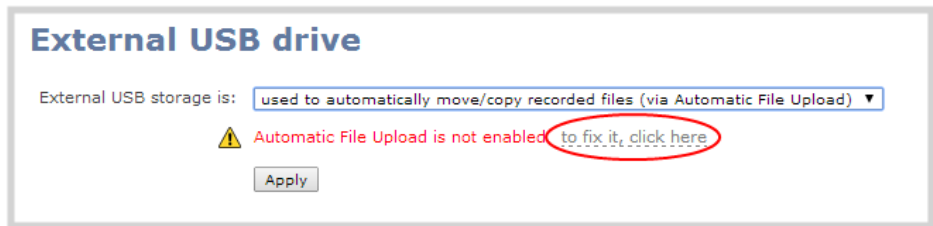
- A properly formatted USB device must be connected to a USB port on Pearl Nano.
- The channel is already added for AFU, see [Set the channel to include in AFU](#).
- AFU is enabled and the parameters configured, see [Enable AFU, schedule, and set options](#).

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.



Table 62 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 the channel**.
3. Click **Apply**.

Do a one-time copy/move all recordings to USB storage device

When one-time move/copy of files is configured, Pearl Nano 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 63 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 the	If checked, the transfer process creates a sub-folder for the channel into



Name	Description
channel	which the files are copied (within the subfolder for the serial number, if that option is also selected).
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 Nano.

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 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)**.

External USB drive

External USB storage is: used for one-time move/copy of the recorded files (upon insertion) ▼

Maximum number of files to transfer: 100

Create subfolder with device name (900156)

Create subfolder for the channel


Remove after copying

Mark file as downloaded

Ignore already downloaded files

File already exists: replace ▼

Apply

 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 Nano. File transfer starts automatically.
6. Follow the steps to [Safely eject USB storage device](#) 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 the channel to verify if there are files that have yet to be copied.
 - b. [Safely eject USB storage device](#) 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 a USB storage device

You can manually copy recordings to a USB storage device that is connected to Pearl Nano. 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 64 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 the channel	If checked, the transfer process creates a sub-folder for the channel into which the files are copied (within the subfolder for the serial number, if that option is also selected).
File already exists	Choose the action to take if a file with the same name already exists in the copy location: <ul style="list-style-type: none"> • 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 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**.


External USB drive

External USB storage is: used to manually move/copy selected files via web interface ▼

Create subfolder with device name (TSG700558)

Create subfolder for each channel

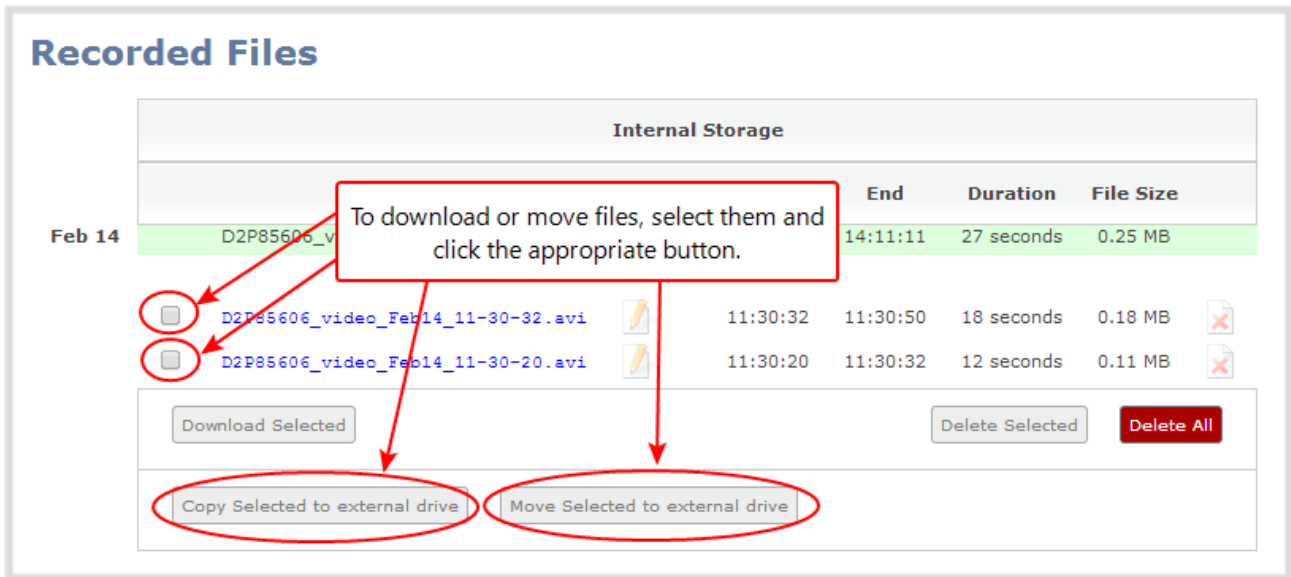
File already exists: replace ▼



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 the USB port on Pearl Nano, then click **Recording** from the Channel menu in the Admin panel. The Recording page opens.
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 Nano.

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.

External USB drive

External USB storage is: used for one-time move/copy of the recorded files (upon insertion) ▼

Maximum number of files to transfer:

- Create subfolder with device name (900156)
- Create subfolder for each channel
- Remove after copying
- Mark file as downloaded
- Ignore already downloaded files

File already exists: replace ▼

Status

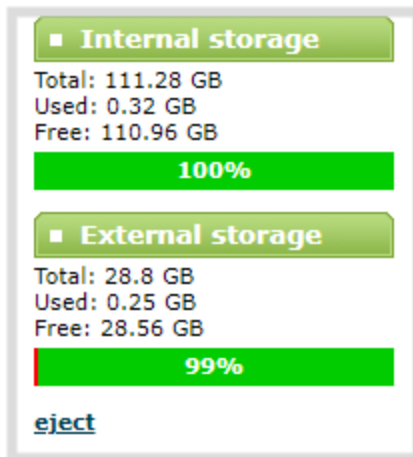
Processed 2 files from 10
Processed 84.8 MB from 251.6 MB
Estimated time: 8 seconds

	File Name	Start	End	Duration	File Size	Progress %	
2021 Feb 16	Auto_Feb16_10-00-18.mp4	15:00:18	15:00:54	36 seconds	24.9 MB	100	✘
	Auto_Feb16_08-29-56.mp4	13:29:56	13:30:53	57 seconds	40.8 MB	100	✘
	Auto_Feb16_08-15-01.mp4	13:15:01	13:18:24	03:23	143.2 MB	13	✘
2021 Feb 05	Auto_Feb05_08-11-30.mp4	13:11:30	13:11:55	25 seconds	18.2 MB	0	✘
	Auto_Feb05_08-09-13.mp4	13:09:13	13:09:19	6 seconds	4.1 MB	0	✘
2021 Feb 04	Auto_Feb04_07-35-09.mp4	12:35:09	12:35:11	2 seconds	1.9 MB	0	✘

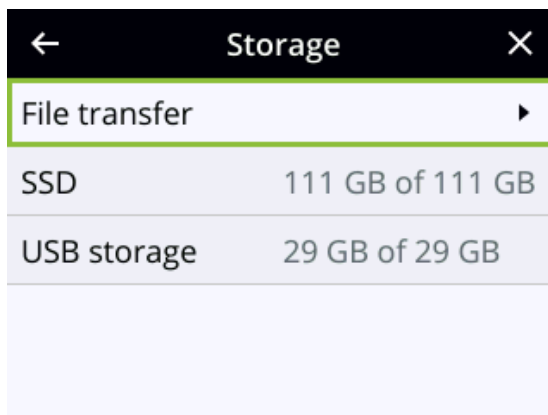
View available USB storage space

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.



You can also view the storage capacity when you select **Storage** using the front screen menu. A USB storage device must be connected to see the USB storage listed.

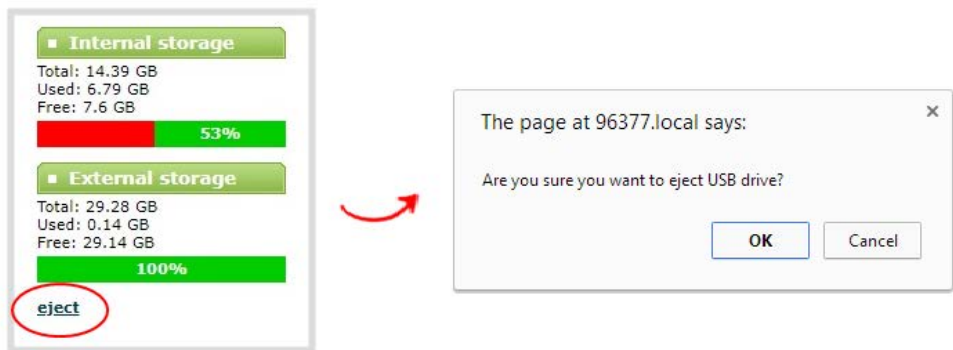


Safely eject USB storage device

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.

Safely eject the USB storage device using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. At the bottom of the menu panel, click **eject** and click **OK** when prompted.



It's now safe to disconnect the USB storage device from Pearl Nano.

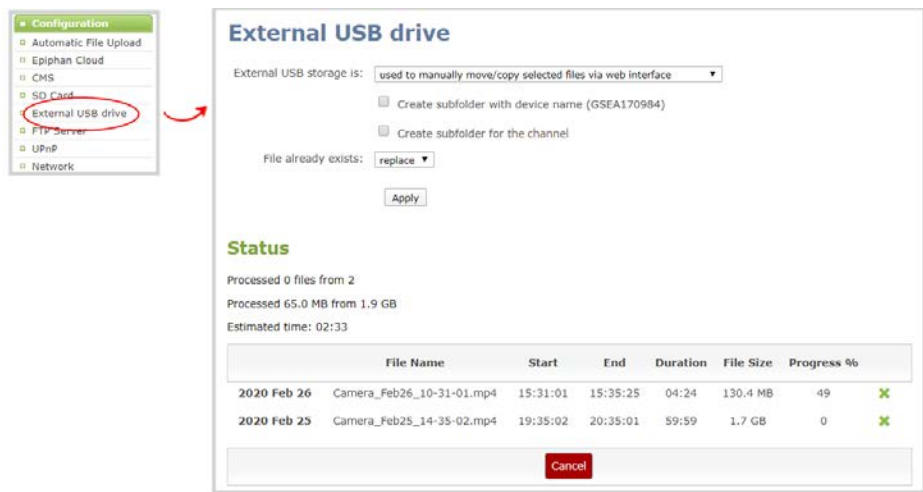
Manage USB file transfer queue

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 Nano 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 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.

 This feature is not available using the local console on Pearl Nano.

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 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**.

Recorded Files

	File Name	Start	End	Duration	File Size	
May 23	<input type="checkbox"/> HDMI-A_May23_10-12-05.mp4	10:12:05	10:12:06	1 seconds	0.00 MB	<input type="checkbox"/>
	<input type="checkbox"/> HDMI-A_May23_10-11-36.mp4	10:11:36	10:11:36	0 seconds	0.00 MB	<input type="checkbox"/>
	<input type="checkbox"/> HDMI-A_May23_08-05-11.mp4	08:05:11	08:16:58	11m 47s	499.25 MB	<input type="checkbox"/>
	<input type="checkbox"/> HDMI-A_May23_07-53-24.mp4	07:53:24	08:05:11	11m 47s	499.25 MB	<input type="checkbox"/>
May 3	<input checked="" type="checkbox"/> HDMI-A_May3_04-41-37.mp4	04:41:37	04:53:24	11m 47s	499.25 MB	<input type="checkbox"/>
	<input type="checkbox"/> HDMI-A_May3_04-29-50.mp4	04:29:50	04:41:37	11m 47s	499.25 MB	<input type="checkbox"/>

Download Selected **Add Selected to Automatic file upload** Delete Selected **Delete All**

What's next?

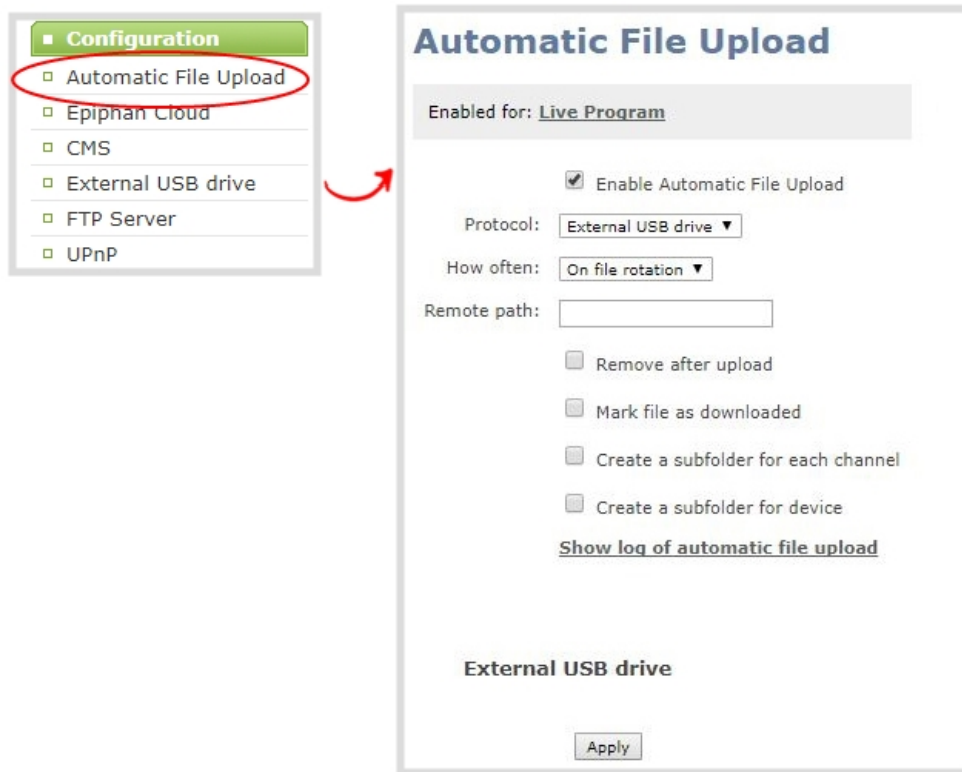
Add more recorded files to the queue or delete any of the recordings before they are uploaded, see [Manage USB file transfer queue](#).

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 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

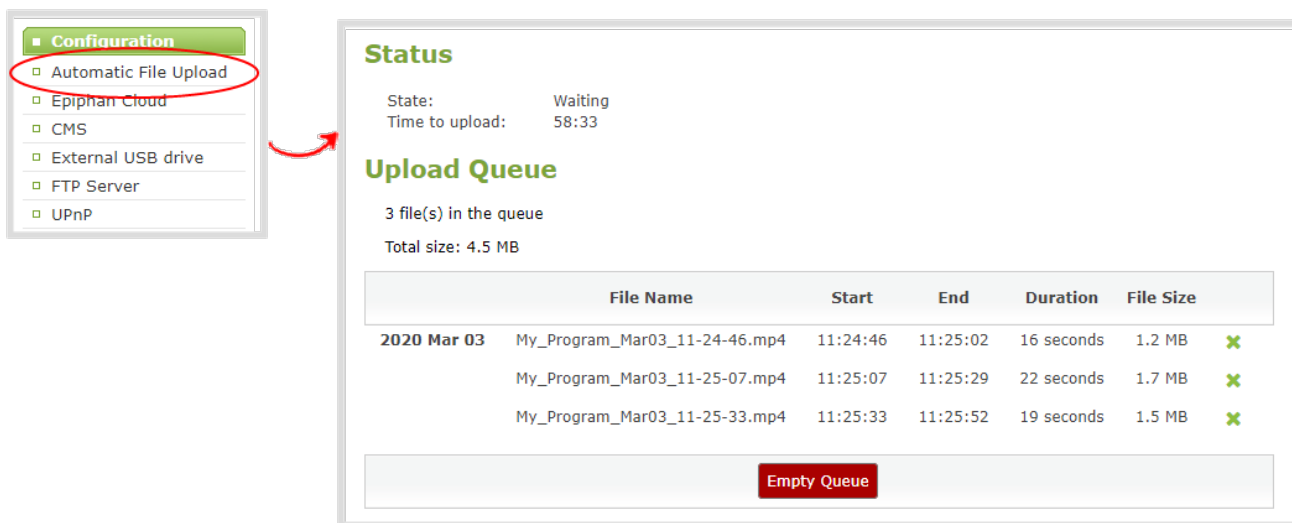
configured for the AFU queue to display.

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 Admin panel](#).
2. From the Configuration menu, click **Automatic File Upload**. If there are files to be uploaded, they appear in the queue.



The screenshot shows the Admin panel interface. On the left, the 'Configuration' menu is open, and 'Automatic File Upload' is selected. A red arrow points from this menu item to the main content area. The main content area is titled 'Status' and shows 'State: Waiting' and 'Time to upload: 58:33'. Below this is the 'Upload Queue' section, which indicates '3 file(s) in the queue' and 'Total size: 4.5 MB'. A table lists the files in the queue:

	File Name	Start	End	Duration	File Size	
2020 Mar 03	My_Program_Mar03_11-24-46.mp4	11:24:46	11:25:02	16 seconds	1.2 MB	X
	My_Program_Mar03_11-25-07.mp4	11:25:07	11:25:29	22 seconds	1.7 MB	X
	My_Program_Mar03_11-25-33.mp4	11:25:33	11:25:52	19 seconds	1.5 MB	X

At the bottom of the queue section, there is a red button labeled 'Empty 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**.

Local FTP server

Pearl Nano can act as an FTP server, allowing you to manually or automatically connect to the system and download recordings. Depending on configuration of the FTP server, you may also be able to remotely delete files after download, maximizing available system storage.



When using an FTP server to download a file, it is possible to start the download while that file is still in the process of being recorded. This results in an incomplete file. To avoid this, check the status of the file in the Admin panel before beginning the download process.

Topics include:

- [Configure the local FTP server](#)
- [Using the local FTP server](#)

Configure the local FTP server

You can setup the local FTP server on Pearl Nano using the Admin panel.

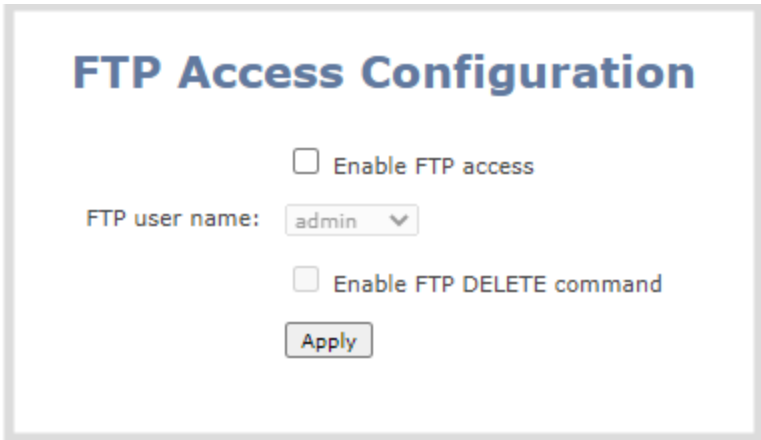
The following table describes the configuration parameters to setup Pearl Nano's local FTP server.

Table 65 *FTP Server Configuration Parameters*


Name	Description
Enable FTP access	The check box controls whether or not the system acts as an FTP server. By default this is disabled.
FTP user name	Select one of the system users: admin, operator, or viewer. The ftp password will be the access password for the selected user. By default the admin user is selected.
Enable FTP DELETE command	Controls whether or not FTP users can delete files. By default file deletion is not permitted.

Configure local FTP server on Pearl Nano using the Admin panel


1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **FTP Server**. The FTP Server configuration page opens.




3. To enable or disable the FTP server, do one of the following:
 - a. Check **Enable FTP access** and select a user from the **FTP user name** drop down. Then click **Apply** to enable the FTP server.
 - b. Uncheck **Enable FTP access** and click **Apply** to disable the FTP server.

 The ftp password is the regular access password for the selected user. See **User administration** for details on user names and passwords.

4. To allow or disable FTP users to delete files, do one of the following:
 - a. Check **Enable FTP DELETE command** and click **Apply** to allow users to delete files.

 Any currently logged in ftp users must log out and back in again to have access to the command.

- b. Uncheck **Enable FTP DELETE command** and click **Apply** to disable file deletion by FTP.

 Any currently logged in users will continue to have access to the delete command until they log out and log in again.

Using the local FTP server

Once you have configured a local FTP server, you can use the tool of your choice to download files from Pearl Nano.

Files are stored in a folder structure with a folder for each channel and a folder for each recorder. Channel and recorder numbers are displayed next to the name of the channel or sources in the Admin panel.



- Channel folders are labeled *video<channel number>* (i.e. video3 for channel 3)
- Recorder folders are labeled *videom<recorder number>* (i.e. videom1 for the first recorder).

Prerequisites

- The IP address of your Pearl Nano, see [Verify IP address and MAC address of Pearl Nano](#)
- An FTP tool
- The username and password for your FTP user, see [Configure the local FTP server](#)

In the following example, the IP address of Pearl Nano is 192.168.1.210, the username is **admin**, there is no password, and the Windows command line ftp utility is used.

Connect to the FTP server

1. Open a command window on Windows (alternatively open a terminal window on Linux/Mac, or open your FTP utility of choice).
2. Establish an ftp connection using the command: **ftp 192.168.1.210**
3. Provide the username: *admin* (provide the username of your FTP user).
4. Provide the password: (provide the correct password for your FTP user).
5. Type **dir** to see the file structure.

```

Administrator: C:\Windows\system32\cmd.exe - ftp 192.168.1.210

c:\>ftp 192.168.1.210
Connected to 192.168.1.210.
220 Operation successful
User (192.168.1.210:(none)): admin
331 Password
Password:
230 Operation successful
ftp> dir
200 Operation successful
150 Directory listing
total 48
drwxrwxrwx  4 0  0          4096 Feb 12 20:37 video1
drwxrwxrwx  3 0  0          4096 Feb 12 19:35 video10
drwxrwxrwx  3 0  0          4096 Feb 13 14:50 video11
drwxrwxrwx  2 0  0          4096 Feb 11 15:22 video2
drwxrwxrwx  3 0  0          4096 Feb 11 15:38 video3
drwxrwxrwx  3 0  0          4096 Feb 12 14:43 video4
drwxrwxrwx  3 0  0          4096 Feb 12 14:44 video5
drwxrwxrwx  3 0  0          4096 Feb 12 15:22 video6
drwxrwxrwx  3 0  0          4096 Feb 12 15:22 video7
drwxrwxrwx  3 0  0          4096 Feb 12 15:22 video8
drwxrwxrwx  3 0  0          4096 Feb 12 15:52 video9
drwxrwxrwx  4 0  0          4096 Feb 13 14:35 videom1
226 Operation successful
ftp: 793 bytes received in 0.00Seconds 793000.00Kbytes/sec.
ftp>
    
```

6. Use **dir** or your tool's GUI to look in each folder for recordings.
7. Use **get** or your tool's transfer mechanism to transfer files to your computer.

```
ftp> dir videom1
200 Operation successful
150 Directory listing
total 920
-rw-r--r--  1 0      0      934130 Feb 13 14:35 UGA.1392302138.Recorder_1.avi
drwxrwxrwx  2 99     99     4096 Feb 12 20:44 trash
226 Operation successful
ftp: 163 bytes received in 0.00Seconds 163.00Kbytes/sec.
ftp> get videom1/UGA.1392302138.Recorder_1.avi
200 Operation successful
150 Opening BINARY connection for videom1/UGA.1392302138.Recorder_1.avi (934130 bytes)
226 Operation successful
ftp: 934130 bytes received in 0.08Seconds 12131.56Kbytes/sec.
ftp>
```

8. If enabled in the FTP configuration page, delete the file after downloading it by issuing the delete command, or using your tool's delete mechanism.



If the delete command is not enabled, attempting to delete a file will result in an Unknown Command error.

PART 5: Integration

Pearl Nano is fully integrated with Kaltura and Panopto Content Management Systems (CMSs). Learn to use the Admin panel to set up and manage Pearl Nano with Kaltura and Panopto, as well as how to record and stream.

Topics include:

- [Kaltura registration](#)
- [Panopto registration](#)
- [Kaltura recording and webcasting setup](#)
- [Panopto recording and webcasting setup](#)
- [CMS recording and webcasting control on Pearl Nano](#)

For information about using the Pearl Nano RS-232 and HTTP/HTTPS APIs, see the [Pearl System API Guide](#).

Kaltura registration

Pearl Nano is fully integrated with Kaltura Content Management Systems (CMSs) for a seamless video recording and webcasting experience. After Pearl Nano is registered, the encoder 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. Registering Pearl Nano 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 Nano as an encoder resource for Kaltura. After Pearl Nano 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 Nano 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 Nano 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 Nano. For more information, see [Reassign a registered resource](#).

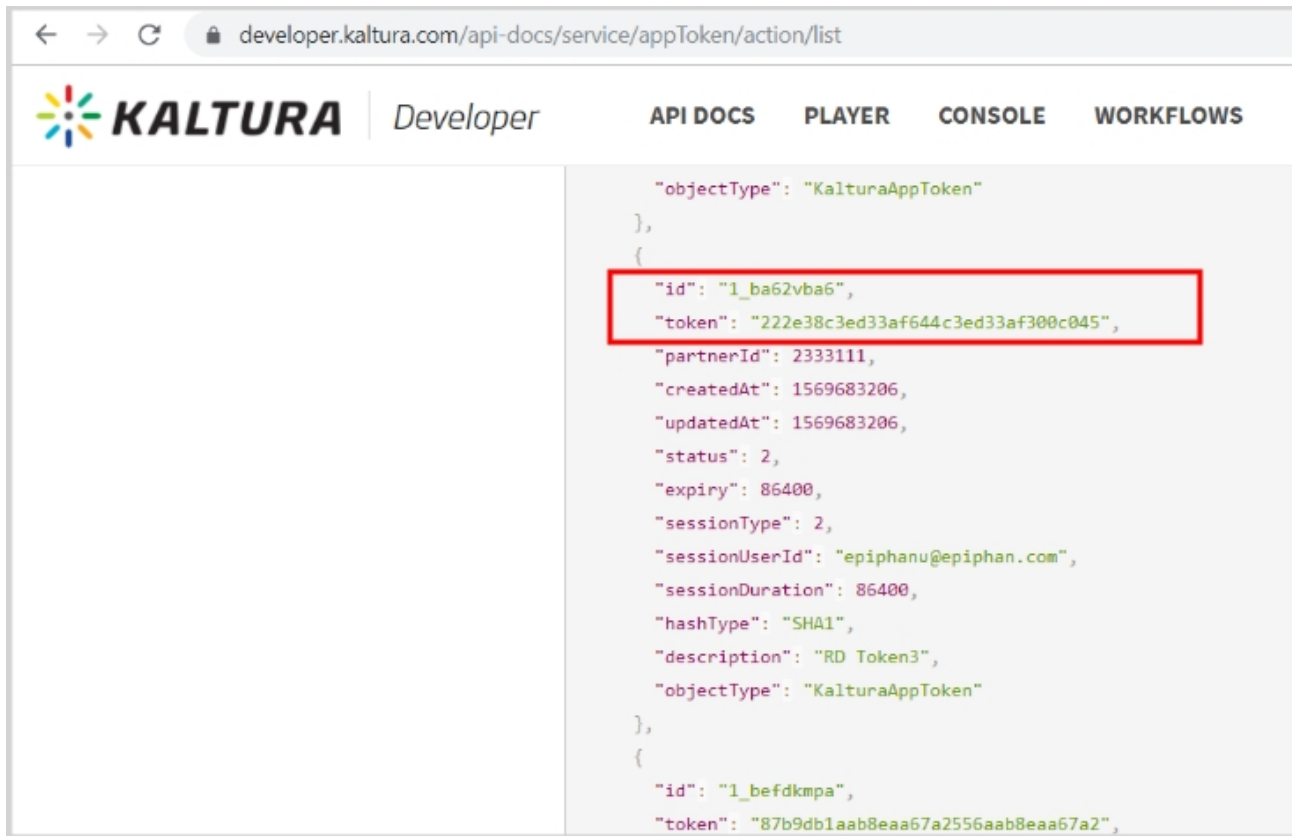


It may take some time for Kaltura to display a newly registered resource, depending on how busy the Kaltura system is when you register.

There are two methods to register your Pearl Nano:

- 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 Nano: an administrative session type and a user session type. With an administrative session token, Pearl Nano 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, LIVE_STREAM_ADD

```

Important considerations for user session application tokens

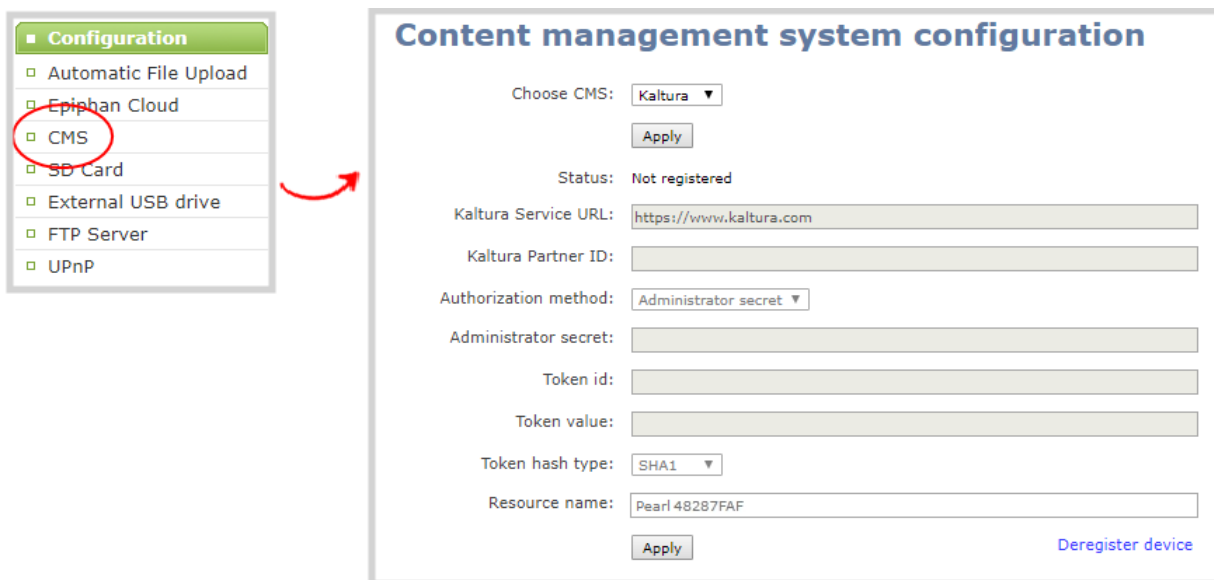
- Pearl Nano uploads all events (scheduled and ad hoc) to the user account ID associated with the user token.
- All event recordings (scheduled and ad hoc) upload to the Kaltura account of the user who created the event if there is no user ID associated with the token.
- Do not include a creation date for the user session token. A creation date in the token causes Pearl Nano to upload events only to 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 Nano as a resource and register with Kaltura using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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 your Pearl Nano.
6. Click **Register device**.

An Events screen is added to Pearl Nano's front screen. Press the **left arrow** key on the control key interface until you see the Events screen display. This is where you can see a list of scheduled Kaltura events for your Pearl Nano device.

What's next

Check the VOD and webcasting event settings and specify the default ad hoc event parameters. See [Kaltura recording and webcasting setup](#).

Disable or deregister from Kaltura

You can disable CMS for a registered Pearl Nano using the Admin panel and still select Pearl Nano as a resource using Kaltura MediaSpace. However, the events schedule won't synchronize on Pearl Nano and any events that are scheduled to start while CMS is disabled do not start on Pearl Nano. If CMS is re-enabled on Pearl Nano before the event is scheduled to end, that event will start automatically after the events schedule is refreshed on Pearl Nano, 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 Nano, you can record and stream events as usual. CMS is disabled by default.

Deregistering removes Pearl Nano 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 Nano, 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 ad hoc (manual) Kaltura events when CMS is disabled or when Pearl Nano has been deregistered.
- When CMS is disabled or Pearl Nano is deregistered, existing scheduled events that are associated with the device do not record or stream.

- If Pearl Nano is deregistered, existing events associated with that device lose the association. You must select a new resource for those events.
- Ensure the deregistered Pearl Nano 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.

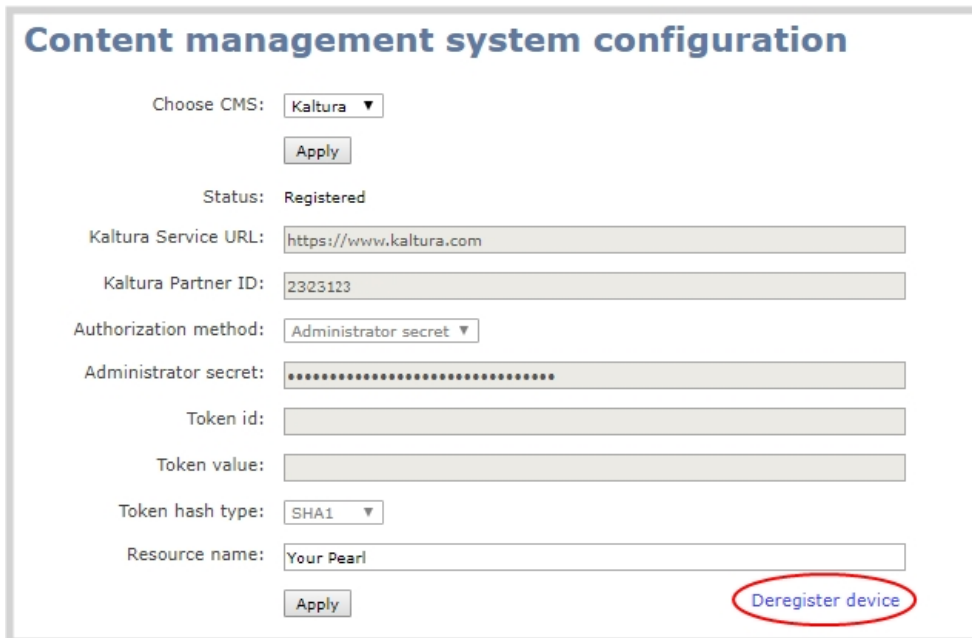
STOP After disabling or deregistering from Kaltura, the recording file size limit for the channel resets to 64 GB. Check to ensure this value does not exceed the maximum recording space allowed for the installed SD card and change the value to avoid unintentionally overwrite existing recordings. For more information about setting the recording file size limit, see **Configure recording settings, file size and type**.


Disable Pearl Nano as a resource or deregister from Kaltura using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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 Nano, click **Deregister device**.



 The calendar icon disappears from Pearl Nano'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 Nano while it's registered with Kaltura.

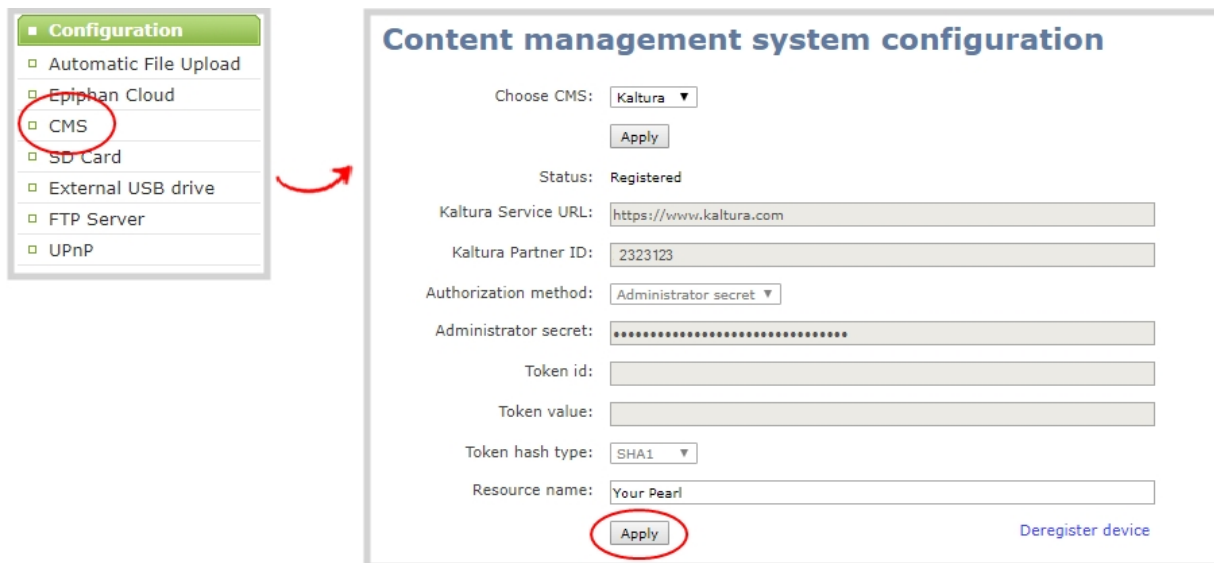
Each Pearl Nano is assigned a unique resource name that includes the serial number of the device by default. You can transfer scheduled VOD and scheduled webcasting events from one resource to another by assigning Pearl Nano the same resource name as another resource.

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 Nano.

- 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 Nano.
- 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 the Pearl Nano resource name using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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 Nano encoder with another one, you can simply reassign the existing Pearl Nano resource name to the replacement Pearl Nano.

Assigning Pearl Nano the same resource name when you register the encoder transfers all the existing schedules and recordings over to the replacement Pearl Nano. 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 Nano 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 Nano with Kaltura. If you apply a configuration preset to set up the replacement Pearl Nano with the settings from the currently registered Pearl Nano, the replacement Pearl Nano 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 Nano 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 Nano 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 Nano using the same resource name to take over the resource instance that is still registered in Kaltura.

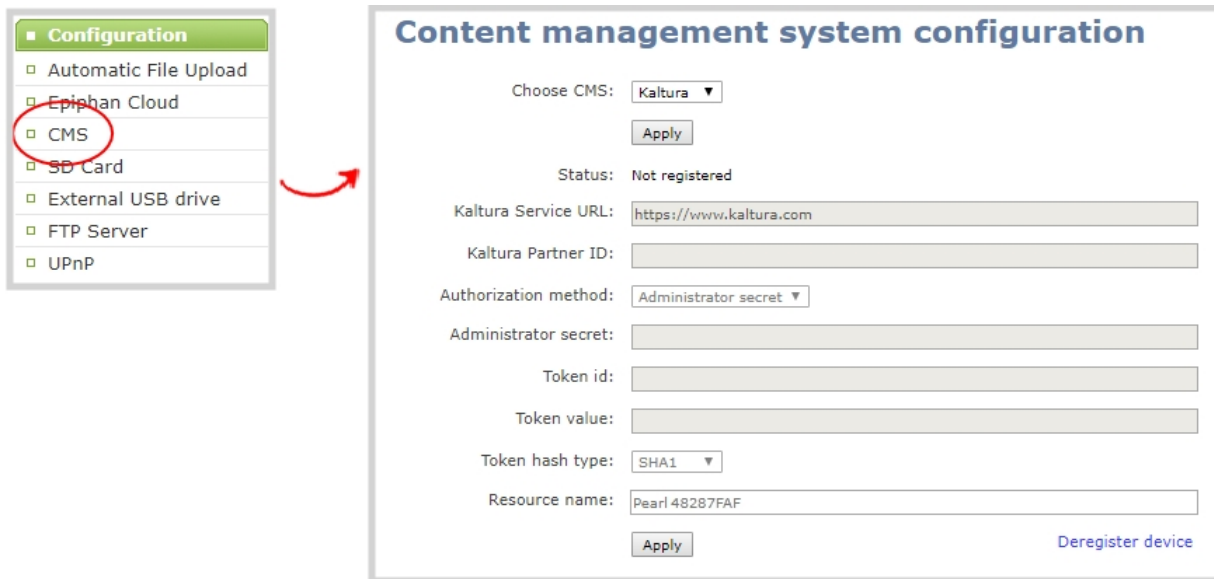
Before you begin, you should already have:

- A Kaltura instance created
- Access to the Kaltura Management Console (KMC)
- Your Kaltura partner ID
- Your Kaltura administrator secret

Enable Pearl Nano 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 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 Nano 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

Pearl Nano appears as an available resource as soon as the device is registered with Kaltura. The channel you setup on Pearl Nano is treated as a single video source. For more information about using the auto channel feature on Pearl Nano or customizing the channel layout, see [What is a channel?](#)

Topics include:

- [About Kaltura recording and webcasting](#)
- [Set up channel for Kaltura VOD events](#)
- [Set up channel for Kaltura webcasting and backup URL](#)
- [Set Kaltura ad hoc event parameters](#)
- [Change the events schedule refresh interval](#)
- [Use RTMPS for a Kaltura webcasting event](#)

About Kaltura recording and webcasting

Pearl Nano supports scheduled events, recurring events, and unscheduled ad hoc recordings and webcasts. After Pearl Nano is registered, Kaltura users can simply assign Pearl Nano 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 Pearl Nano. If the network connection or the CMS goes down during an event, Pearl Nano 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 front panel control key interface on Pearl Nano.



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.

Kaltura treats the channel you setup on Pearl Nano as a single video-source event for VODs and webcasts. The event recording is uploaded to Kaltura and appears as a single entry in the Kaltura media list. The name of the uploaded recording includes the name of the channel plus the date and time the file was recorded. For example: **Channel 1_May23_10-12-05**

Pearl Nano administrators can:

- Deselect the Pearl Nano channel so that it cannot be displayed as the main default view when watching the VOD in Kaltura.
- Set ad hoc event parameters.
- Change how often Pearl Nano polls Kaltura for an updated list of Events.

Pearl Nano administrators and operators can use the Admin panel to:

- 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 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](#).

To use the front screen on Pearl Nano to start and stop events, see [Stop/start scheduled CMS events using the front screen menu](#).

Important considerations:

- Pearl Nano 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 Pearl Nano 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.
- If the network connection is lost during a file upload to Kaltura, the transfer automatically restarts when the network connection re-establishes.
- If Pearl Nano loses power while a scheduled event is being recorded, the recording stops. If Pearl Nano 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 Pearl Nano 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 schedule recordings that are longer than the capacity of Pearl Nano to store the recording on the local drive. We recommend using large capacity SD cards such as 256 GB or a large capacity SATA M.2 2280 SSD when using Pearl Nano with a CMS.

- If the time and zone settings of Pearl Nano 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 Pearl Nano, see [Configure date and time](#).
- Do not use AFU or configure recording file size, type and other channel recording settings when CMS is enabled on Pearl Nano.
- To monitor the channel during an event, you can display the Channel view on Pearl Nano's front screen, see [Confidence monitoring using the front screen](#). You can also monitor the channel using the Admin panel.
- 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 RTMP URLs for the modified event loses its 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**.

Set up channel for Kaltura VOD events

Kaltura treats the channel on Pearl Nano as a single video-source event for scheduled and ad hoc VOD events. After Pearl Nano is registered with Kaltura, the channel defaults should work for scheduled VOD events without further configuration. However, you can disable the channel for VOD events using the Admin panel. To set up ad hoc parameters, see [Set Kaltura ad hoc event parameters](#).

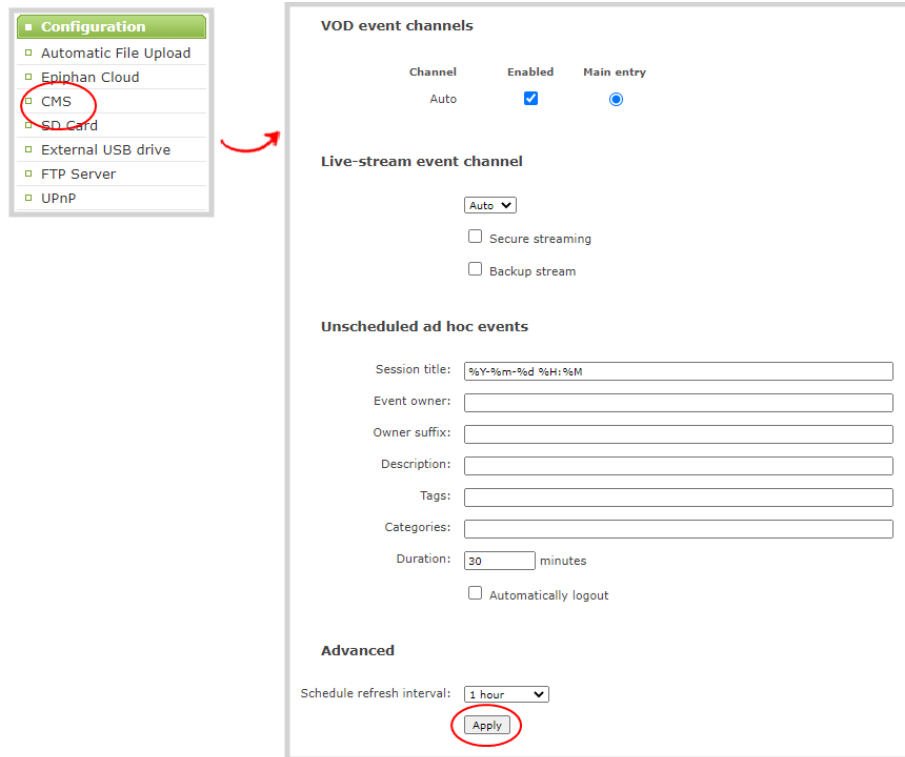


For information about how to customize the channel, see **Channel layout examples**.

The channel is automatically set as the main entry, which is the default view that people see when they are watching. Adding VOD metadata and edits like trimming the VOD can be done later in Kaltura after the recording has uploaded.

Select channels for event views using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.



3. Under **VOD event channels**, uncheck **Enabled** to disable the channel for VOD events or leave it checked to enable using the channel for VOD events.
4. Click **Apply**.

Set up channel for Kaltura webcasting and backup URL

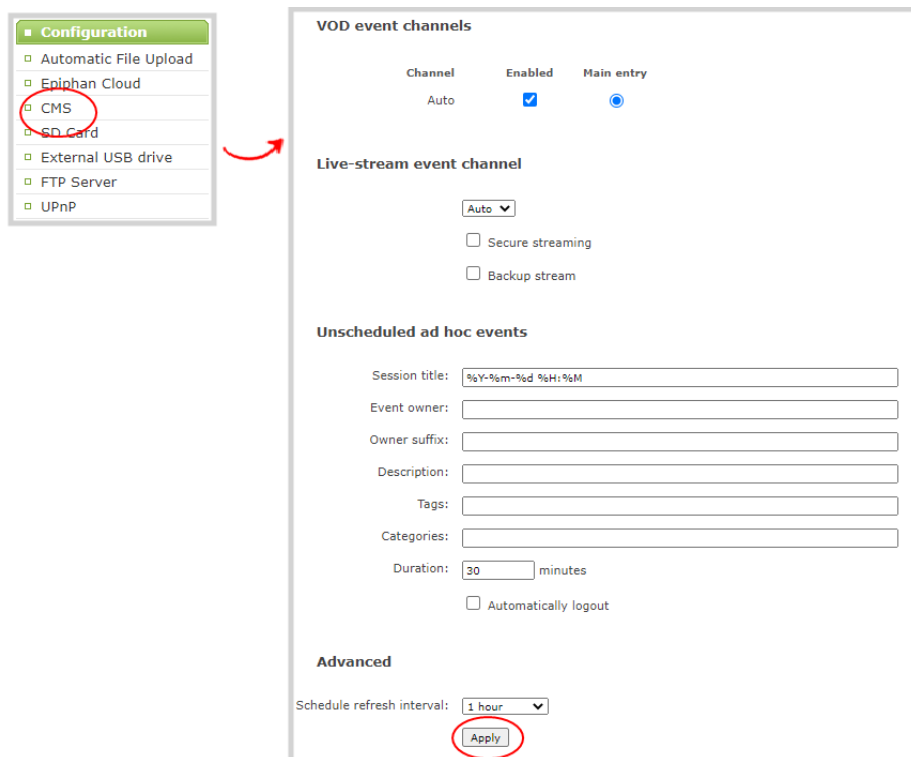
Pearl Nano's channel is automatically selected for scheduled and ad hoc webcasting events. However, you can choose to stream the event to the secondary backup stream URL using the Admin panel.

When a webcasting event is scheduled in Kaltura or started from Pearl Nano as an unscheduled ad hoc event, the stream url and other event settings are sent to Pearl Nano. When the event is scheduled to start, the ingestion settings are applied automatically to Pearl Nano. Only the primary URL from Kaltura is used by default, but you can optionally enable a secondary backup stream URL.

When it's time for the scheduled webcasting event to start, Pearl Nano automatically sends an RTMP (or RTMPS) stream to the primary URL associated with that event. If you've enabled the backup stream, then Pearl Nano 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.

Set up the channel and backup URL for a scheduled Kaltura webcasting event

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under the **Live-stream event channel** section, the channel is automatically selected. You can optionally select **None** to prevent Pearl Nano from webcasting the channel.
4. (Optionally) Check **Backup stream** to enable streaming to the secondary backup stream URL for this event.
5. Under the **VOD event channels** section, ensure the channel is enabled as the main entry.
6. Click **Apply**.



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.

Table 66 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 Pearl Nano.
Owner suffix	Enter a suffix to be automatically applied to the Event owner field when users authenticate with Kaltura from Pearl Nano using the Admin panel. For example, if the owner account is <i>wilson@myorg.com</i> , enter the suffix <i>@myorg.com</i> here so that the user only needs to enter <i>wilson</i> 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.
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. This is disabled by default.

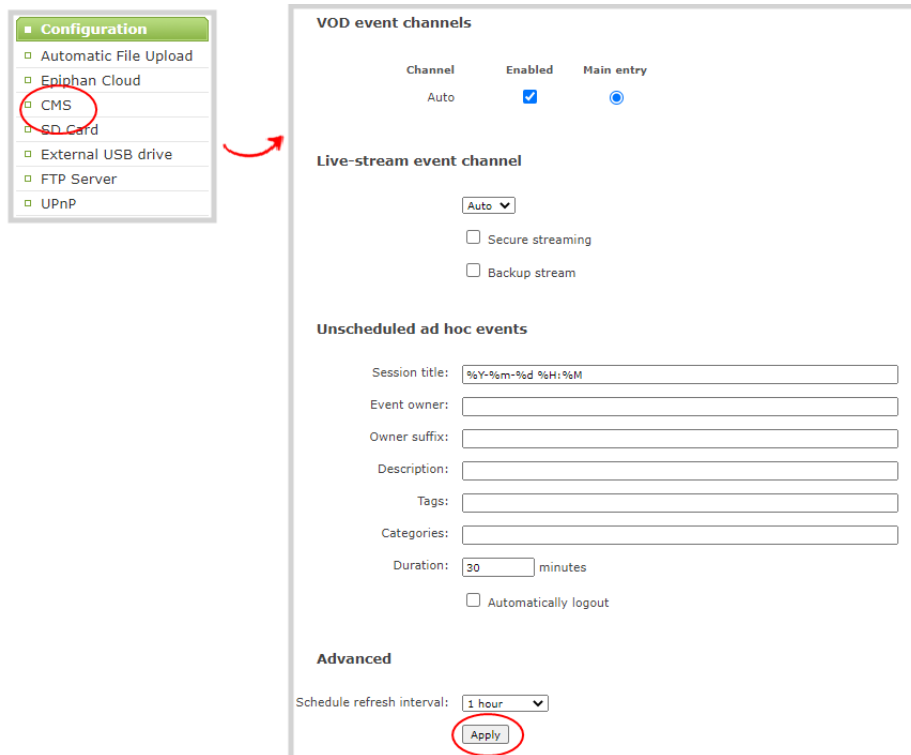
Important considerations

- 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 Pearl Nano registered with Kaltura to create ad hoc events using the Admin panel.

Set default ad hoc event parameters using the Admin panel


1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).

- From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
- Under **Unscheduled ad hoc events**, enter the information you want associated with this ad hoc event and click **Apply**.



Change the events schedule refresh interval

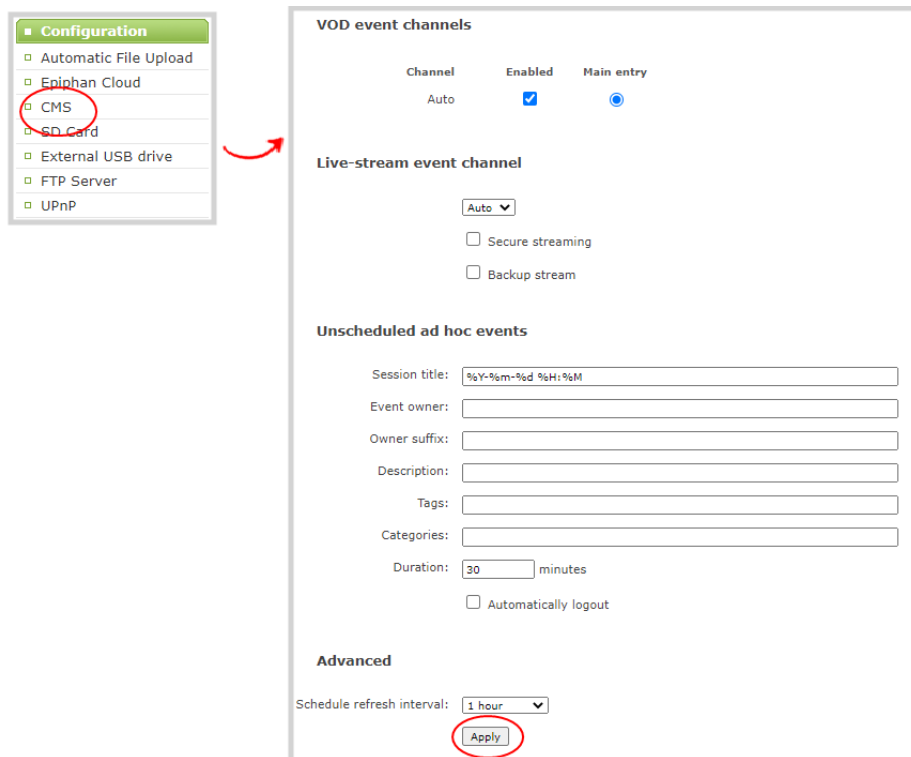
Using the Admin panel, you can change how frequently Pearl Nano polls Kaltura for the latest event information to refresh the events listed on the Events page. The default interval is once every 3600 seconds (1 hour).

 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 Nano polls Kaltura for the latest event information

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



Use RTMPS for a Kaltura webcasting event

Pearl Nano 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, see [Set up channel for Kaltura webcasting and backup URL](#).

You can configure Pearl Nano to send an RTMPS stream instead using the Admin panel.

Configure Pearl Nano to send an RTMPS stream using the Admin panel

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

Live-stream event channel

HDMI ▼

Secure streaming

Backup stream

Panopto registration

Pearl Nano is fully integrated with Panopto Content Management Systems (CMSs) for a seamless video recording and webcasting experience. After a simple registration process, Pearl Nano 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 Nano 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 Nano is registered, proceed to create URL redirects for Pearl Nano, 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 Nano as a remote recorder for scheduled, recurring, and ad hoc recordings and webcasts. When you register Pearl Nano, a default name is assigned that includes the serial number of Pearl Nano. 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.

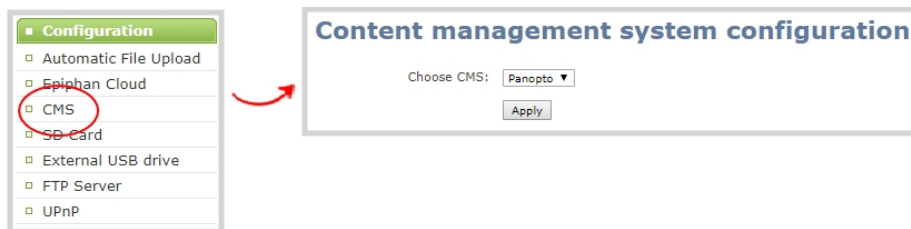
Important considerations

- 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 Nano 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 Nano and register again using a different registration key, the scheduled sessions previously associated with the original key do not migrate over.

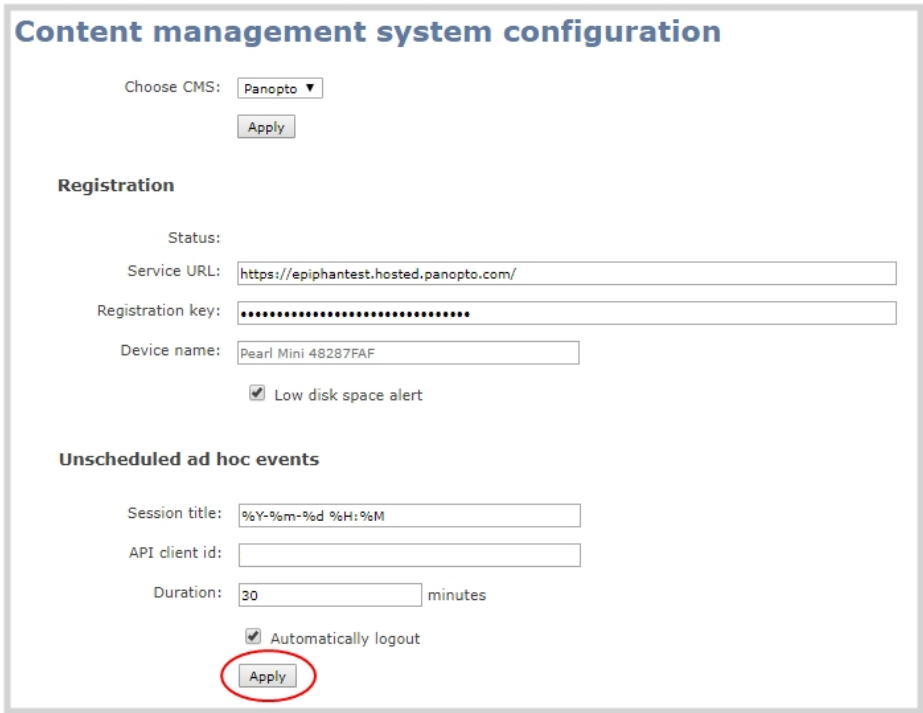
- If you're using the on-premise version of Panopto version 6 or earlier, you must manually add the API key for Pearl Nano. Contact Panopto support for assistance.
- If you are unable to register Pearl Nano, contact your Panopto administrator or Epiphan support.
- If you want a different name for this Pearl Nano to appear in Panopto, enter the name into the Device name field before you register Pearl Nano. Changes after Pearl Nano is registered do not appear in Panopto.

Enable Pearl Nano as a remote recorder and register with Panopto using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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**. The Status updates to Connected.



Content management system configuration

Choose CMS: Panopto ▼

Registration

Status: _____

Service URL:

Registration key:

Device name:

Low disk space alert


Unscheduled ad hoc events

Session title:

API client id:


Duration: minutes

Automatically logout

 Changing Panopto's device name for Pearl Nano does not change the name that is assigned to Pearl Nano 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 Nano, 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 Nano, see [Setup Panopto authentication for ad hoc events](#)

Disable CMS and disconnect from Panopto

When you use the Admin panel to disable CMS for a registered Pearl Nano, the remote recorder disconnects from Panopto. As long as Pearl Nano 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 Nano before a VOD session is scheduled to end, recording starts automatically on Pearl Nano 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 Nano as a remote recorder is performed in Panopto, see Panopto's documentation for instructions. If you delete Pearl Nano in Panopto, all scheduled and recurring events that were associated with Pearl Nano are permanently deleted.



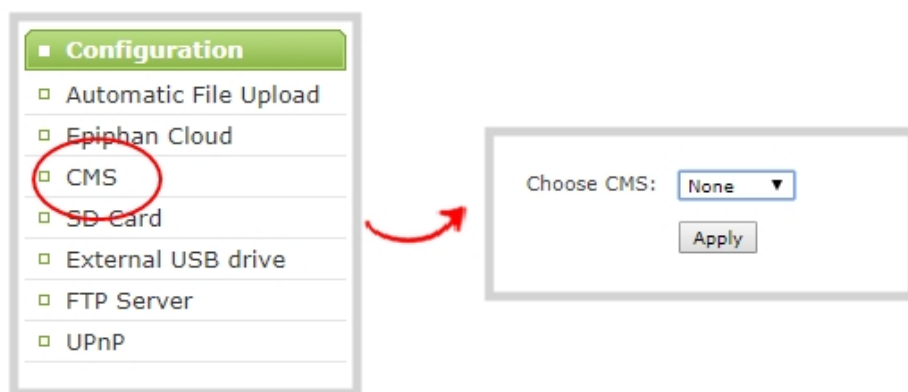
Content Management Systems (CMSs) can change channel settings automatically. After disabling CMS on Pearl Nano, it's good practice to check your channel settings or apply a configuration preset to restore your channel to known values.

Important considerations

- You cannot start unscheduled ad hoc events when CMS is disabled on Pearl Nano.
- Sessions that are scheduled to start while CMS is disabled on Pearl Nano do not start on Pearl Nano.
- Scheduled webcasting events do not start if Pearl Nano's connection to Panopto is not available.
- Deleting Pearl Nano 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 Nano from Panopto using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. To disconnect Pearl Nano, select **none** from the **Choose CMS** drop down and then click **Apply**.



Panopto recording and webcasting setup

Pearl Nano appears as an available resource as soon as the device is registered with Panopto and the channel is treated as a single video source. Now you must setup authentication for ad hoc events to create ad hoc events from Pearl Nano. For more information about channels, see [What is a channel?](#).

Topics include:

- [About Panopto recording and webcasting](#)
- [Setup Panopto authentication for ad hoc events](#)
- [Set Panopto ad hoc event parameters](#)
- [Disable low disk space Panopto alerts](#)

About Panopto recording and webcasting

Pearl Nano 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. A back up recording of the channel is also saved locally on Pearl Nano. If the network connection or the CMS goes down during an event, Pearl Nano continues to record locally and uploads the recording when network connectivity resumes.

You can start and stop events earlier than the scheduled time using the Admin panel or the front panel control key interface on Pearl Nano.



Starting or stopping a scheduled VOD event before the scheduled start or stop time does not change the event into an ad hoc event.

Panopto treats the channel you setup on Pearl Nano as a single video-source event for recordings and webcasts. For ad hoc events, the default name of the uploaded recording 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.

Pearl Nano administrators can:

- Setup Panopto authentication for ad hoc events, see [Setup Panopto authentication for ad hoc events](#).
- Set Panopto ad hoc event parameters, [Set Panopto ad hoc event parameters](#).

Pearl Nano administrators and operators can use the Admin panel to:

- 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](#).

To use the front screen on Pearl Nano to start and stop events, see [Stop/start scheduled CMS events using the front screen menu](#).



Panopto users select the channel resolution in Panopto when creating a new scheduled or recurring session. The Panopto encoding settings are applied automatically to the channel and overrides the channel encoding settings made using the Admin panel.

Important considerations:

- Pearl Nano must be registered with Panopto to record and stream Panopto events, see [Enable CMS and register with Panopto](#).
- The maximum allowed bitrate for events in Panopto is 4 Mbps, regardless of what bitrate is actually set for the target resolution of the remote recorder in Panopto. Pearl Nano ignores the quality settings made in Panopto. The channel's configured frame rate and bitrate are used. Ensure the bitrate configured for the channel encoding is 4 Mbps or less.
- 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 Nano 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 Nano'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 Nano loses power while a scheduled event is being recorded, the recording stops. If Pearl Nano is powered back on before the scheduled end time for the event, recording of the scheduled event restarts automatically and a second recording is created. When the event ends, both files are uploaded to Panopto.
- If Pearl Nano 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 Nano.
- Do not schedule recordings that are longer than the capacity of Pearl Nano to store the recording on the local drive. We recommend using large capacity SD cards such as 256 GB or a large capacity SATA M.2 2280 SSD when using Pearl Nano with a CMS.
- For ad hoc events, Pearl Nano 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.
- Do not remove the SD card while files are uploading to Panopto.
- Channel encoding settings you make on Pearl Nano are overridden by the default encoding settings the system uses to record to Panopto.
- To monitor the channel during an event, you can display the Channel view on Pearl Nano's front screen, see [Confidence monitoring using the front screen](#). You can also monitor the channel using the Admin panel or see a live preview of the channel and the audio level from the remote recorder page in Panopto.



For Panopto VOD events, if you manually stop a scheduled VOD event before the scheduled end time when Pearl Nano doesn't have network connectivity, Pearl Nano 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 Nano.

Setup Panopto authentication for ad hoc events

Panopto users can create unscheduled ad hoc events using the Admin panel. You can set up Pearl Nano 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.

Pearl Nano uses a JavaScript web application to negotiate authentication with Panopto. You must create a new API client ID and add a URL redirect for Pearl Nano's Admin panel in Panopto for ad hoc event authentication to work.

Before you begin, you need:

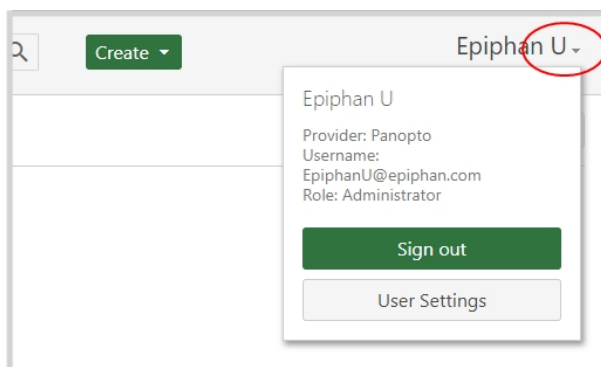
- Admin access to Panopto.
- A Pearl Nano remote recorder that's registered with Panopto.

Important considerations

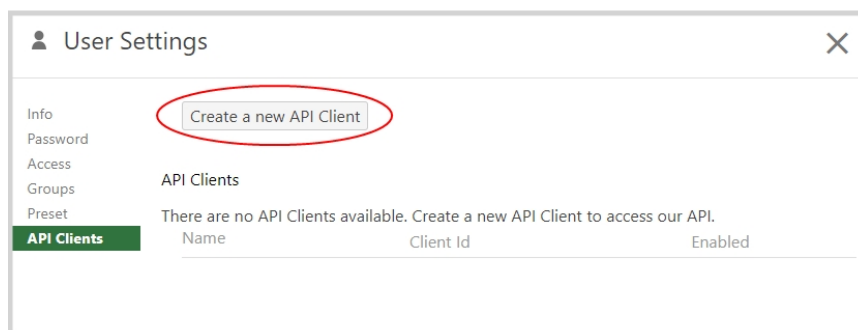
- Record all API client IDs and secret keys that are generated in Panopto somewhere safe. The ID and key cannot be retrieved after the screen is closed and must be regenerated if lost.
- You can use the same API Client ID to enable ad hoc authentication on multiple Pearl Nano systems; however, you must create a separate API client URL redirect for the web-based Admin UI of each individual Pearl Nano device.
- Third-party application authentication for ad hoc events is only supported for Panopto.

Enable ad hoc authentication on Pearl Nano

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.



3. Create the API Client ID. 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 Nano API client in the **Client Name field**. If a client already exists in Panopto with that name, choose a different name.

Create API Client ✕

Client Information

Client Name

Client URL

Client Type

Server-side Web Application
Select this option to use the API with a web application that has a server side component.

JavaScript Web Application
Select this option to use the API with a web application that is Javascript based, or does not have a server component (i.e. Single Page Apps)

- c. In the **Client Type** field, select JavaScript Web Application, then click **Create API Client**.
 - d. 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.

User Settings ✕

Info

Password

Access


Groups

Preset

API Clients

Name	Client id	Enabled	
Pearl API Client	5d2de923-c923-4fdf-a923-d2d923f97afe	Yes	Edit ✕

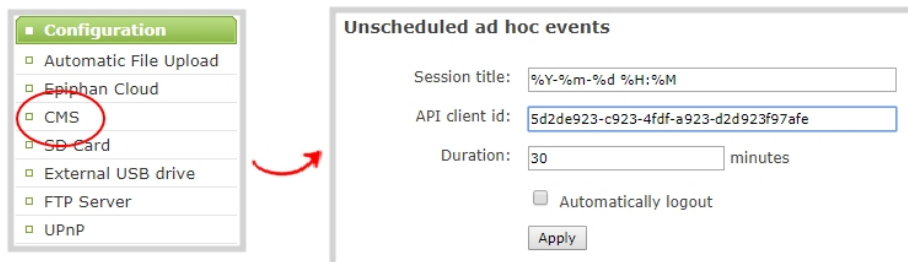
- b. In the Allowed Redirect URLs field, enter `http://<device_ip>/admin/events` where `<device_ip>` is the IP address of Pearl Nano.

 If Pearl Nano 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.

Allowed URL	URL Type	
<code>http://10.2.3.72/admin/events</code>	Redirect URL	✕

5. Login to the Admin panel as **admin**, see [Connect to 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 Nano **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:

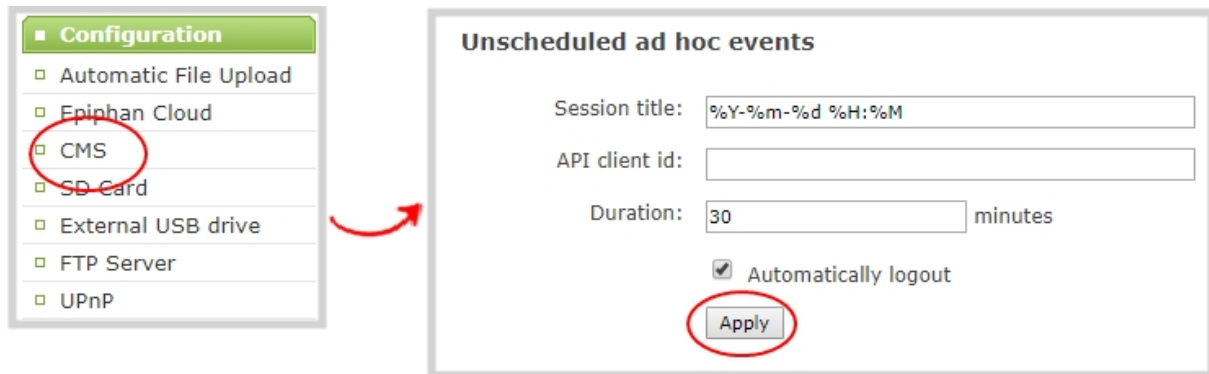
- **Session title:** This assigns a default title for ad hoc events. Default variables specify the current date and time as the title using the format **yyy-mm-dd hh:mm**. This default title can be changed when an ad hoc event is created.
- **API client id:** This is the API client ID that was generated for ad hoc event authentication, see [Setup 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.



Pearl Nano must be connected to Panopto for this procedure to work.

Enter Panopto ad hoc event parameters using the Admin panel

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



Disable low disk space Panopto alerts

Pearl Nano 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 Nano 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. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **CMS**. The Content management system configuration page opens.

3. Uncheck **Low disk space alert** and click **Apply** to disable sending these alerts to Panopto.

Content management system configuration

Choose CMS: Panopto ▼

Registration

Status: _____

Service URL:

Registration key:

Device name:

Low disk space alert

Unscheduled ad hoc events

Session title:

API client id:

Duration: minutes

Automatically logout

4. To enable this feature again, simply check **Low disk space alert** and click **Apply**.

CMS recording and webcasting control on Pearl Nano

Pearl Nano 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 Nano 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 Nano and uploads automatically when network connectivity resumes. You can manually control recording and webcasting using the Admin panel or the front screen and control key interface. Back up recordings are easily recovered using the Admin panel.



Do not schedule recordings that are longer than the capacity of Pearl Nano to store the recording on its local drive. We recommend using large capacity SD cards such as 256 GB or a large capacity SATA M.2 SSSD when using Pearl Nano with a CMS.

Topics include:

- [Create ad hoc events using the Admin panel](#)
- [Start/stop scheduled CMS events using the Admin panel](#)
- [Stop/start scheduled CMS events using the front screen menu](#)
- [Logout of an ad hoc session](#)
- [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](#).

Start/stop scheduled CMS events using the Admin panel

You can start scheduled Kaltura and Panopto 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 Pearl Nano doesn't have network connectivity, Pearl Nano 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 Nano.

- Do not power down Pearl Nano while a scheduled webcast event is in progress. The webcast ends but the RTMP stream that was created automatically on Pearl Nano 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.

Events

Last updated 14:53, 2018-11-15

Refresh schedule

Not logged in

Create new event

Ongoing and completed events

Event	Name	Type	Status
2018-11-15 13:53-13:55	Nov 15 VOD event	VOD	Complete
2018-11-15 13:20-13:23	Nov 15 live event	Live-stream	Complete

Page 1 of 1

Scheduled events

Event	Name	Type	Status
2018-11-15 14:55-14:57	Epiphan U Session	VOD	Recording 00:01:25

Page 1 of 1

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.

Ongoing and completed events

Event	Name	Type	Status
2018-11-15 14:55-14:57	Epiphan U Session	VOD	Recording 00:01:25
2018-11-15 13:53-13:55	Nov 15 VOD event	VOD	Complete
2018-11-15 13:20-13:23	Nov 15 live event	Live-stream	Complete

TIP: In the Admin panel, you can click **Refresh schedule** at any time to manually update the events listed on the Events page.

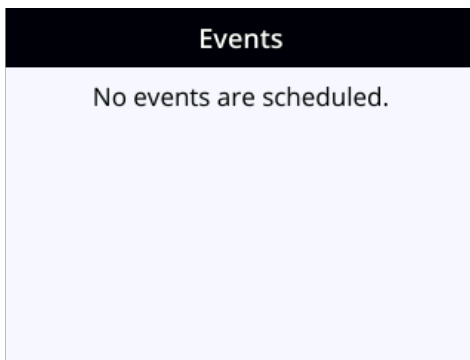


After the event ends, it may take a while for content to show up in Kaltura's media lists, depending on how busy the Kaltura CMS system is at the time.

Stop/start scheduled CMS events using the front screen menu

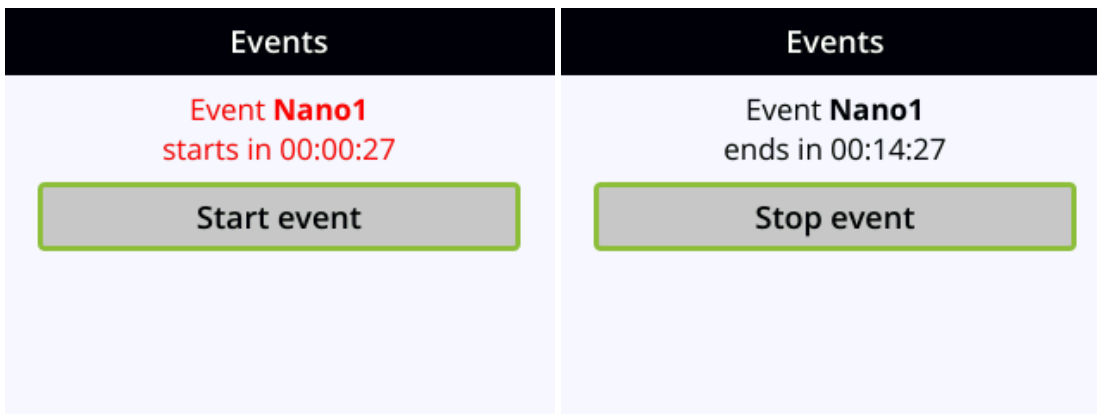
You can use Pearl Nano's front screen and the control key interface to manually start scheduled events up to thirty minutes before the scheduled start time.

When CMS is enabled on Pearl Nano, an Events screen is added to the screens you can view on the front screen. If you don't see the Events screen on the front screen, press the **left arrow** key (or the right arrow key) on the control key interface to cycle through the different views.



When an event is scheduled, the Event screen updates with the event name and a countdown timer. Five minutes before the scheduled event, the event name and timer on the Events screen turn red. You can select **Start event** using the control keys to start the event up to a half an hour before the scheduled start time.


When the event starts, the button changes to Stop event. Select **Stop event** when you're done or just wait for the event to stop automatically at the scheduled time. Recordings upload automatically to your CMS.



For important considerations before recording or webcasting to a CMS, see [About Kaltura recording and webcasting](#) and [About Panopto recording and webcasting](#).

Important information

- Pearl Nano must already be registered with your CMS to appear listed as a remote recorder resource in Kaltura or Panopto. Contact your CMS administrator responsible for setting up hardware encoders for your organization if Pearl Nano isn't listed as a resource or the calendar icon does not appear on the touch screen.
- Pearl Nano's channel is treated as a single, primary video source in Kaltura and Panopto.
- For Kaltura, the channel used for live streaming is pre-configured by the Pearl Nano administrator.
- Panopto users can select the resolution for the video source in Panopto when a new scheduled or recurring session is created. The encoding settings are applied automatically to the channel on Pearl Nano
- 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, Pearl Nano continues to record the event locally. When network connectivity re-establishes and the event ends, the recording uploads to the CMS as expected.

 For Panopto VOD events, if you manually stop a scheduled VOD event before the scheduled end time when Pearl Nano doesn't have network connectivity, Pearl Nano 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 Nano.

Create ad hoc events using the Admin panel

You can create and start an ad hoc recording or webcast using the Admin panel. Pearl Nano must be registered with your CMS to create ad hoc events, see [Integration](#).

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

The screenshot shows a web form for creating a Kaltura event. It is divided into two main sections: 'Account' and 'Event details'.
- Under 'Account', there is a text input for 'Event owner' containing 'EpiphanU' and a green 'Login' button.
- Under 'Event details', there are several input fields: 'Session Title' (2019-07-04 14:45), 'Description' (a large text area), 'Tags', 'Category', 'Duration' (a dropdown menu set to 30), and 'Event type' (a dropdown menu set to VOD).
- At the bottom of the form are two buttons: a green 'Cancel' button and a green 'Start event now' button.

Table 67 Kaltura 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: 2019-07-04 13:22
Description	Enter a description of the event.

Item	Description
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

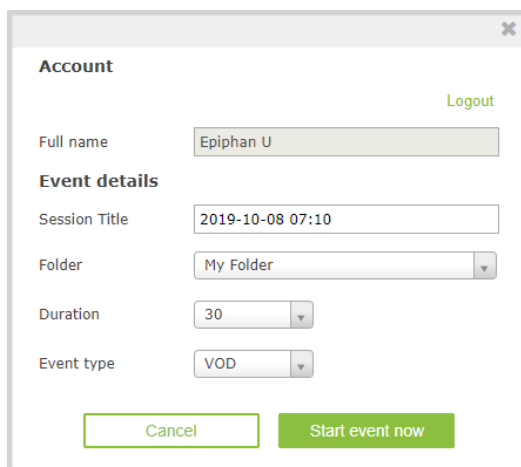


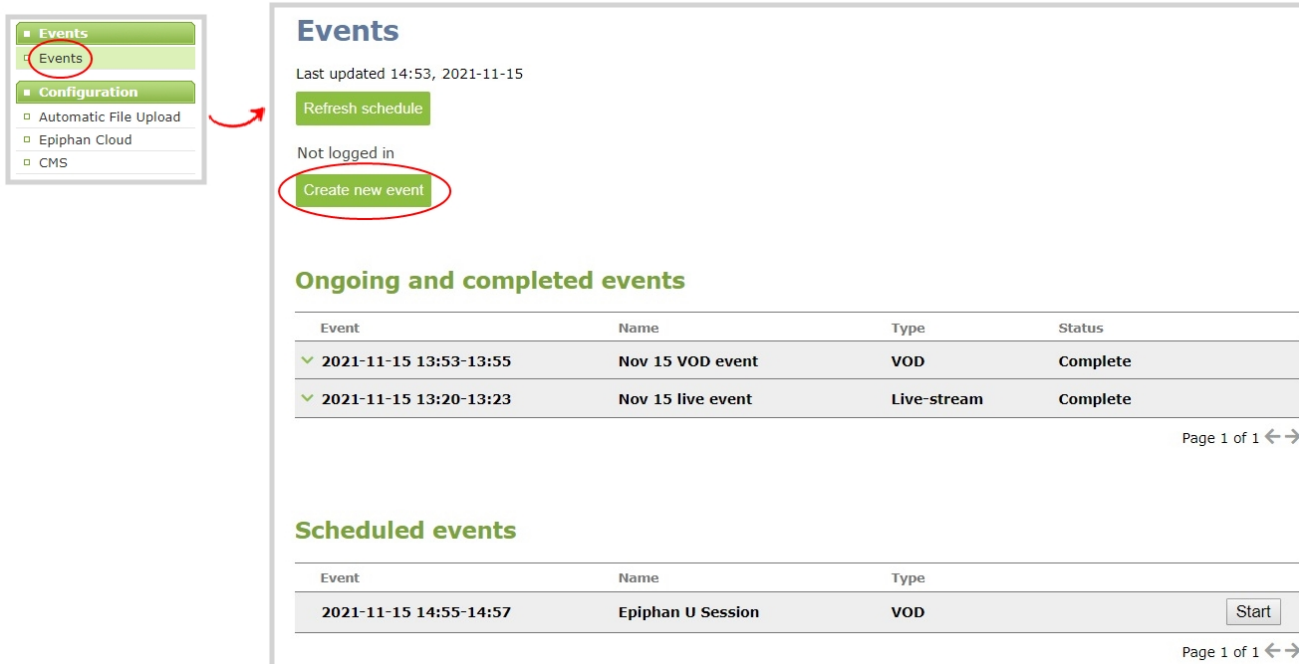
Table 68 Panopto ad hoc event details

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, Pearl Nano 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

Item	Description
	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 Admin panel](#).
2. From the Events menu, click **Events**. The Events page opens.



Events

Last updated 14:53, 2021-11-15

[Refresh schedule](#)

Not logged in

[Create new event](#)

Ongoing and completed events

Event	Name	Type	Status
2021-11-15 13:53-13:55	Nov 15 VOD event	VOD	Complete
2021-11-15 13:20-13:23	Nov 15 live event	Live-stream	Complete


Page 1 of 1 [←](#) [→](#)


Scheduled events

Event	Name	Type
2021-11-15 14:55-14:57	Epiphan U Session	VOD

Page 1 of 1 [←](#) [→](#)

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 Nano. 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 [Logout of an ad hoc session](#).

Logout of an ad hoc session

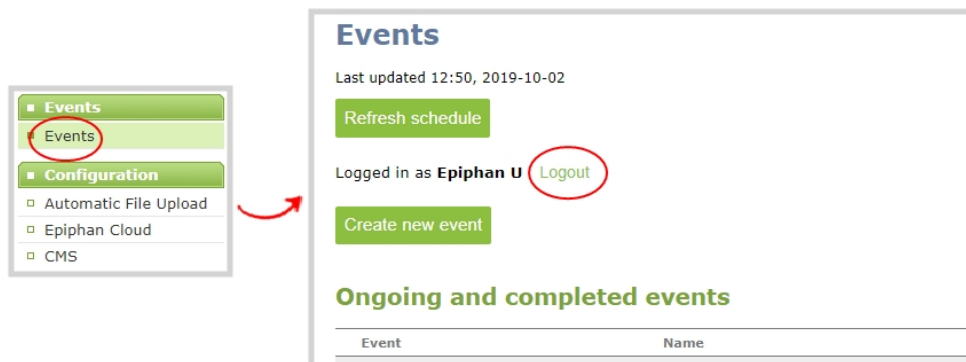
After you've logged into Kaltura from the Admin panel and started an unscheduled ad hoc event, your login session stays active for one hour after the event ends. You are automatically logged out after one hour.

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, manually logout after you're ad hoc event ends.

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 the third-party LMS.

- 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.

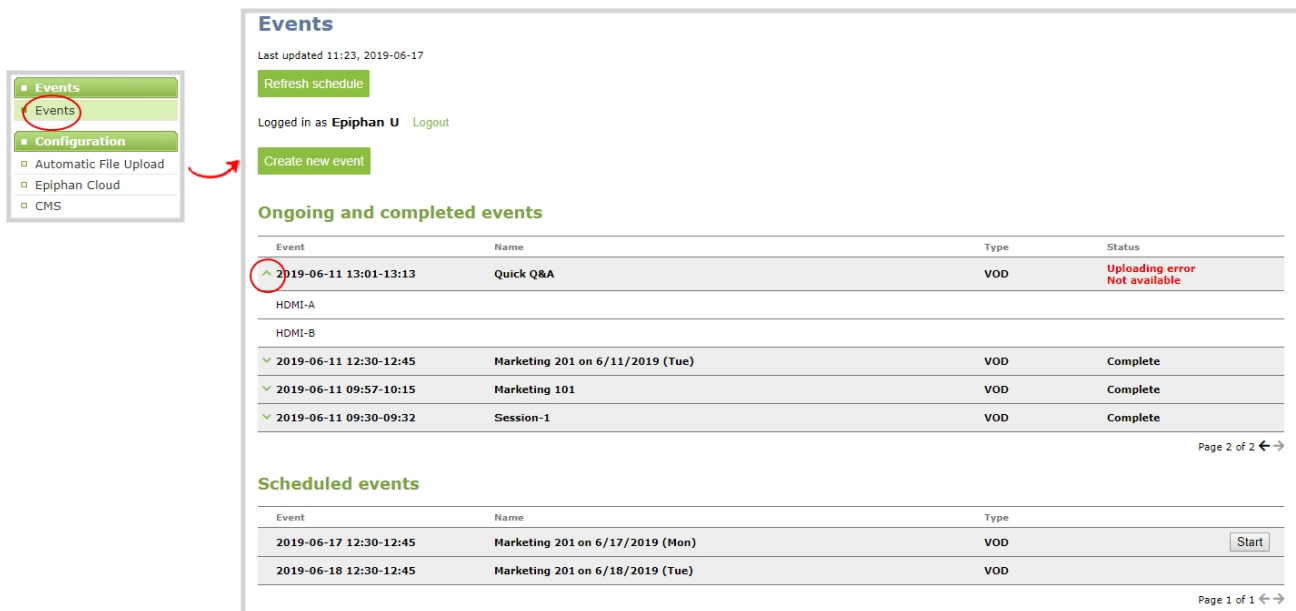
Recover channel backup recordings

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 Pearl Nano.

Pearl Nano 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 Nano 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

- Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
- From the Events menu, click the arrow icon beside the event to see which channels were included for that event.



Event	Name	Type	Status
2019-06-11 13:01-13:13	Quick Q&A	VOD	Uploading error Not available
HDMI-A			
HDMI-B			
2019-06-11 12:30-12:45	Marketing 201 on 6/11/2019 (Tue)	VOD	Complete
2019-06-11 09:57-10:15	Marketing 101	VOD	Complete
2019-06-11 09:30-09:32	Session-1	VOD	Complete

Event	Name	Type	
2019-06-17 12:30-12:45	Marketing 201 on 6/17/2019 (Mon)	VOD	Start
2019-06-18 12:30-12:45	Marketing 201 on 6/18/2019 (Tue)	VOD	

3. From the Channel 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.

Recorded Files

	File Name	Start	End	Duration	File Size	
May 23	<input type="checkbox"/> HDMI-A_May23_10-12-05.mp4					
	<input type="checkbox"/> HDMI-A_May23_10-11-36.mp4					
	<input type="checkbox"/> HDMI-A_May23_08-05-11.mp4					
	<input type="checkbox"/> HDMI-A_May23_07-53-24.mp4					
	<input checked="" type="checkbox"/> HDMI-A_May23_07-41-37.mp4					
	<input type="checkbox"/> HDMI-A_May23_07-29-50.mp4					

Download Selected To delete files, select them and click "Delete Selected". Delete Selected Delete All

To delete all files, click "Delete All".

 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).

PART 6: Maintenance

Keep your Pearl Nano running smoothly using the latest firmware updates and maintenance features.

Topics include:

- [Power down and system restart](#)
- [Backup your Pearl Nano setup](#)
- [Perform a factory reset](#)
- [Firmware upgrade](#)
- [Support](#)
- [Register your device](#)
- [Storage capacity and maintenance](#)

Power down and system restart

You can do the following to power off Pearl Nano or reboot the device:

- Choose **Reboot** from the Maintenance page using the Admin panel.
- Reboot using the front screen menu.
- Power off the device by removing the power adapter cable attached to the rear panel of Pearl Nano.

Reboot the device using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. Under the section called Maintenance, select **Reboot Now** and click **OK** when prompted.



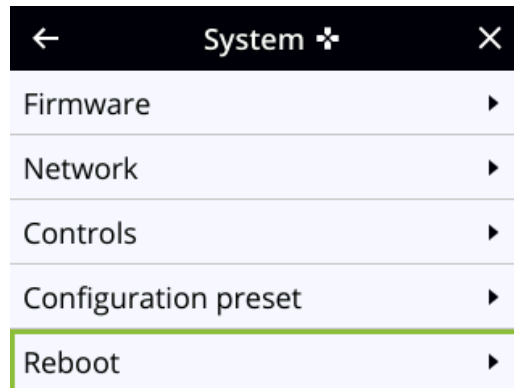
Reboot the device using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



Menu	
Channel	▶
Inputs	▶
Storage	▶
System	▶

2. Use the arrow and check mark keys to select **System**. Then from the System screen, scroll down using the arrow key and select **Reboot**.



3. Press the **check mark** key to select **Reboot now** when prompted.

Backup your Pearl Nano setup

Configuration presets are the perfect way to backup your Pearl Nano 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](#).

Create a configuration preset


Name:

Sections

- System
- Network
- Inputs
- EDID
- Channel
- Automatic File Upload
- Content Management System
- Epiphan Cloud
- Front screen
- Output port

Perform a factory reset

Administrators can use the Admin panel to perform a factory reset and restore the configuration of Pearl Nano 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 Nano.

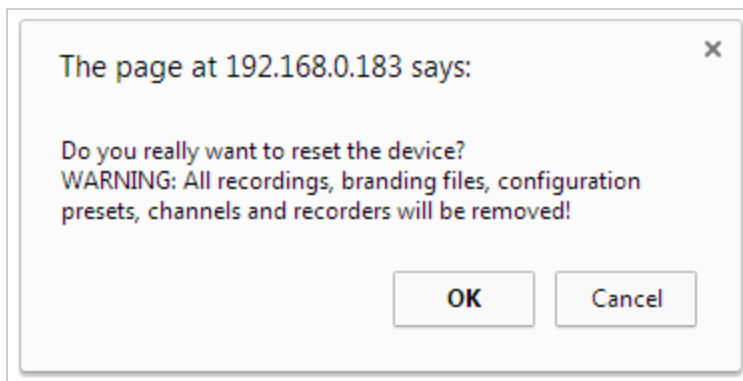
Consider applying a factory default configuration preset if you want to preserve your uploaded media files, configuration presets, and channel recordings, see [Configuration presets](#).

Perform a factory reset using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.



3. Under the section called Maintenance, 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 Nano.

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 Nano, install new firmware whenever the system indicates that a firmware update is available.

Topics include:

- [Check for firmware updates](#)
- [Update the firmware](#)
- [BIOS update](#)



The BIOS update section appears on the **Firmware Update** page only when your Pearl Nano system requires a BIOS update.

Check for firmware updates

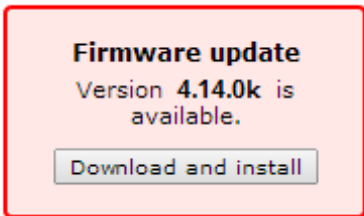
Your Pearl Nano automatically checks for firmware updates if the **Enable connection to maintenance server** option is checked on the **Maintenance** page of the Admin panel. You can also manually check for updates if your Pearl Nano has internet access. Don't miss out on any feature enhancement. Register your Pearl Nano 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.

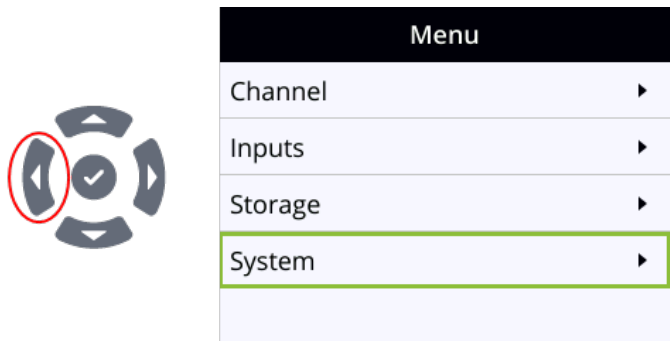
Manually check for new firmware using the Admin panel

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

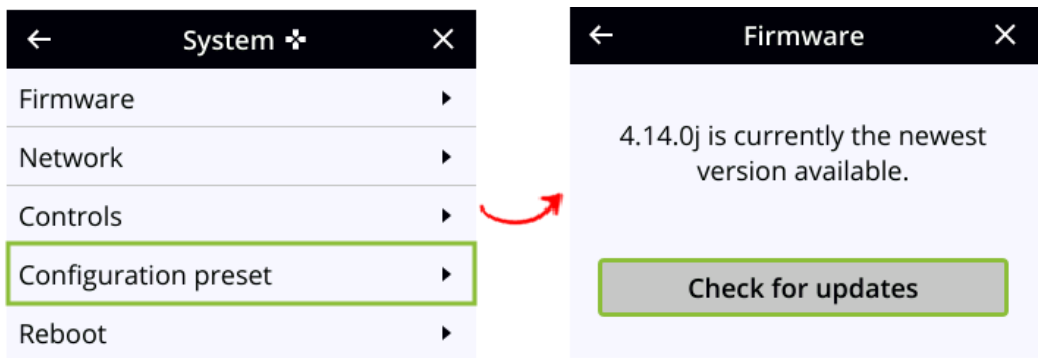


Manually check for new firmware using the front screen menu

1. Press the **left arrow** key repeatedly on the control key interface until the Menu screen displays.



2. Use the arrow and check mark keys to select **System**. Then from the System screen, scroll down using the arrow key and select **Reboot**.



3. Press the **check mark** key to select **Reboot now** when prompted.

Update the firmware

If your Pearl Nano 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 Nano 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 Nano.

While the firmware is updating, the front 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

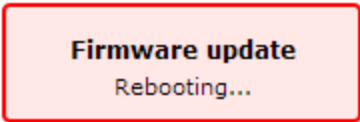
1. Login to the Admin panel as **admin**, see [Connect to Admin panel](#).
2. (Optional) Save a copy of the current system configuration. See [Configuration presets](#).
3. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens.
4. Do one of the following:
 - a. Click **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.

A notice that the firmware update is in progress appears on the front screen.



 Do not interrupt power to the system during the firmware upgrade.

- When the firmware update is complete, a message lets you know that Pearl Nano is going to reboot. Wait for the system to restart.



- After the system reinitializes, go to the settings for your web browser and clear your web browser's cache.
- Connect to the Admin panel and login as **admin**, see [Connect to Admin panel](#).
- 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 front screen reports the failure. Please collect system information such as the serial number of Pearl Nano, the previous firmware version (if known), and the new firmware version and contact info@epiphan.com



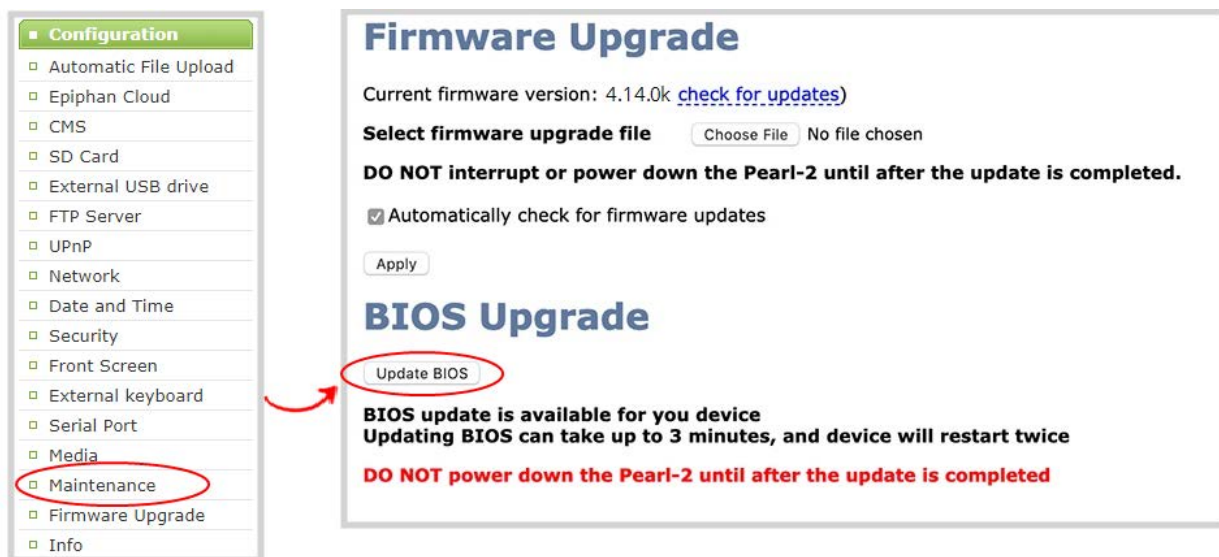
BIOS update

If Pearl Nano 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 Nano system requires a BIOS update.


Perform a BIOS update using the Admin panel

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



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 Nano is going to reboot. Wait for the system to restart.

BIOS UPDATE IS IN PROGRESS!

Don't close this page

```
Reading flash ##### Done
- ME Data Size checking . ok
Secure Flash enabled, recalculate ROM size with signature... Enable.
- FFS checksums ..... ok
Loading capsule to secure memory buffer ##### Done
Erasing Boot Block ##### Done
Updating Boot Block ##### Done
Verifying Boot Block ##### Done
Erasing Main Block ##### Done
Updating Main Block ##### Done
Verifying Main Block ##### Done
```

THE DEVICE IS REBOOTING...

- 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 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 Nano when the section called **BIOS Upgrade** no longer appears on the **Firmware Upgrade** page in the Admin panel.

Support

Your Pearl Nano 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 Nano to help troubleshoot issues and reset lost admin passwords, see [Support](#). 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 5pm Eastern)
- **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 the log files and allinfo file for support.



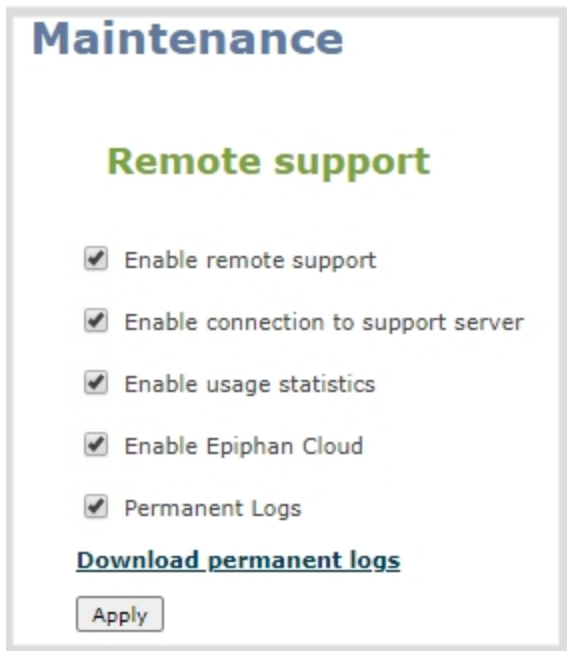
Remote support is only provided for systems covered by SupportPlan+.

Download logs and allinfo file

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.

Download the logs and allinfo file using the Admin panel

1. Login to the Admin panel as **admin**, see [Connect to 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.
5. From your browser, run the **allinfo** script. A file is saved to your computer.

```
http://<ip address of your system>/admin/allinfo.cgi
```

6. Share the log files and the allinfo results with Epiphan support.

Configure remote support

Remote support is enabled on Pearl Nano by default and allows the Epiphan support team to remotely access Pearl Nano 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 Nano must be able to resolve this domain name to connect to the Epiphan maintenance server for remote support.

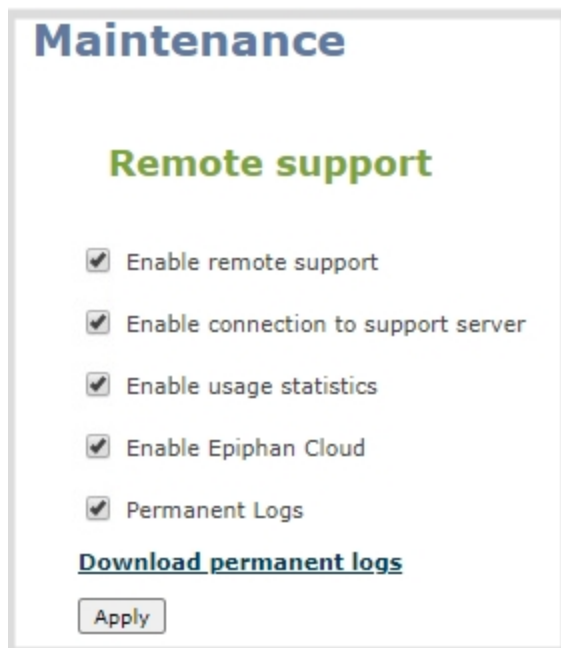
Remote support uses ports 22 and 30. Ensure that these ports are opened to allow remote communication. If your Pearl Nano is on a network that is protected from the Internet by a firewall, consult with your network administrator to configure your network to allow remote Internet access through the firewall 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 Admin panel](#).
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.



Maintenance

Remote support

- Enable remote support
- Enable connection to support server
- Enable usage statistics
- Enable Epiphan Cloud
- Permanent Logs

[Download permanent logs](#)

Apply

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 Nano 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 Nano can't reach the maintenance server, check the network settings (see [Configure DHCP](#)) 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 Nano reaches the maintenance server, ensure your firewall has port 30 open.
9. Confirm with Epiphan support that they are able to access your Pearl Nano for remote troubleshooting.

Disable remote support

Remote support is enabled by default. You can turn remote support off for your Pearl Nano using the Admin panel.



Disabling remote support removes the ability for Epiphan to reset a lost admin password on your Pearl Nano. 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 Nano using the Admin panel

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

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 Nano. Registering your Pearl Nano 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 [Register your device](#)

Have the serial number of your Pearl Nano handy when you 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**.

Device information	
Firmware	4.14.0h
Serial number	900009
CPU load	17%
Name	900009
Description	



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 available, you will not see a banner on the Firmware update page.

Register using the Admin panel

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

Register your Pearl to be eligible for firmware updates and keep up-to-date on all the latest features and performance enhancements

Firmware Upgrade

Current firmware version: 4.14.0k ([check for updates](#))

Select firmware upgrade file No file chosen

DO NOT interrupt or power down the Pearl until after the update is completed.

Automatically check for firmware updates

Storage capacity and maintenance

Pearl Nano has support for removable SD cards, which are formatted to use the ext4 file system and can only be read with a computer running Linux. Video recordings that you make are saved to the SD card. You can check how much space you have left on the SD card using the Admin panel and from the front screen.

If you install a SATA M.2 2280 SSD, the SD card is no longer used for recordings and the status of the SD card changes to not detected. Any video recordings that are saved to the SD card no longer appear in the channel's list of recordings and cannot be download using the Admin panel. We recommend that you temporarily remove the SSD until you have retrieved the recorded files from the SD card using the Admin panel.

Pearl Nano also has local storage for internal processes and 6 GB of that space is allocated for uploaded media, like image files that you add to your channel layout. You can see how much space you have for media files from the Media menu using the Admin panel.

Topics include:

- [Check storage capacity](#)
- [Check media storage capacity](#)

Check storage capacity

Using the Admin panel, the amount of available storage space on the SD card is shown at the bottom of the menu panel, as well as on the SD card configuration page.



If a SATA M.2 2280 SSD is installed in Pearl Nano, the available storage space on the SSD is shown at the bottom of the menu panel and the SD card option is removed from the list of Configuration menu options in the Admin panel.

You can also check available storage capacity using the front screen menu on Pearl Nano. The total amount of storage capacity depends on the size of storage device you install.

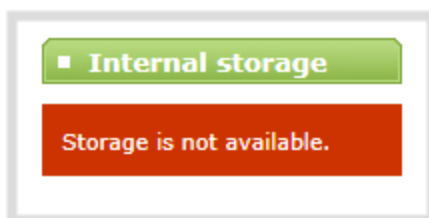
It's good practice to check how much storage you have available. If the amount of storage is low, you can swap SD cards or remove some of the recorded files, see [Manage recorded files](#) and [FTP and automatic file transfers](#).

Check the storage capacity using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. Using the Admin panel, 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.



If no SD card or SSD is installed, the following appears:



Check storage capacity from the front screen

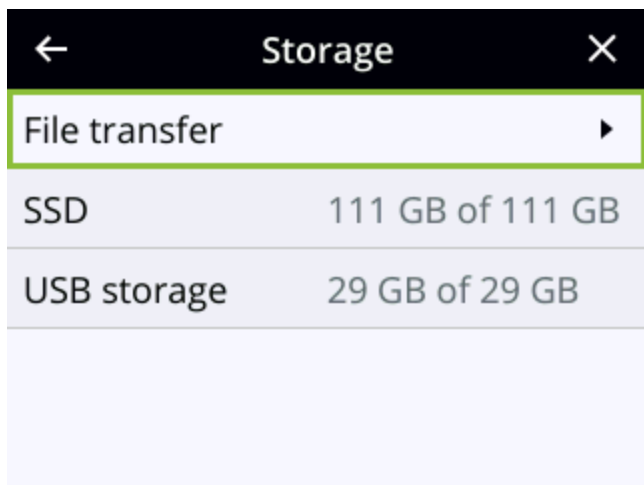
Press the **left arrow** key repeatedly on the control key interface until the System status screen appears. The amount of storage available on the installed storage media is displayed.

System status	
IP address	10.113.1.101
Firmware	4.14.0i
Uptime	07:22
CPU load	9%
SD card	111 GB of 111 GB
USB storage	Not detected



If a SATA M.2 2280 SSD is installed, the SSD storage capacity displays instead of the SD card.

You can also view the storage capacity when you select **Storage** using the front screen menu. A USB storage device must be connected to see the USB storage appear.



Check media storage capacity

Pearl Nano has 6GB of internal storage that's allocated for uploaded media, like image files that you add to a channel layout. You can see how much space you have for media files using the Admin panel.

Check media storage capacity using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see [Connect to Admin panel](#).
2. From the Configuration menu, select **Media**. The Media configuration page opens with the amount of capacity listed at the top of the page.




Media

5.8 GB available of 6.1 GB

Upload file

Choose file to upload: No file chosen

Files [Delete all](#)

Epiphan_Logo_Vert_only.png	12.5 kB	January 22 2021 12:36:11	
diag_background_blue-gen-conf.png	659.6 kB	January 22 2021 12:32:19	
diag_slides.png	28.8 kB	January 22 2021 12:32:26	

PART 7: Troubleshooting

Pearl Nano has easy-to-use diagnostic tools to test connectivity status, check upload/download bandwidth, traceroute, and more to help you troubleshoot your Pearl Nano. 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](#)
- [Troubleshooting Quick Reference](#)
- [Remove black bars \(matte\) from the video](#)
- [Use a specific EDID for the video input port](#)



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**.

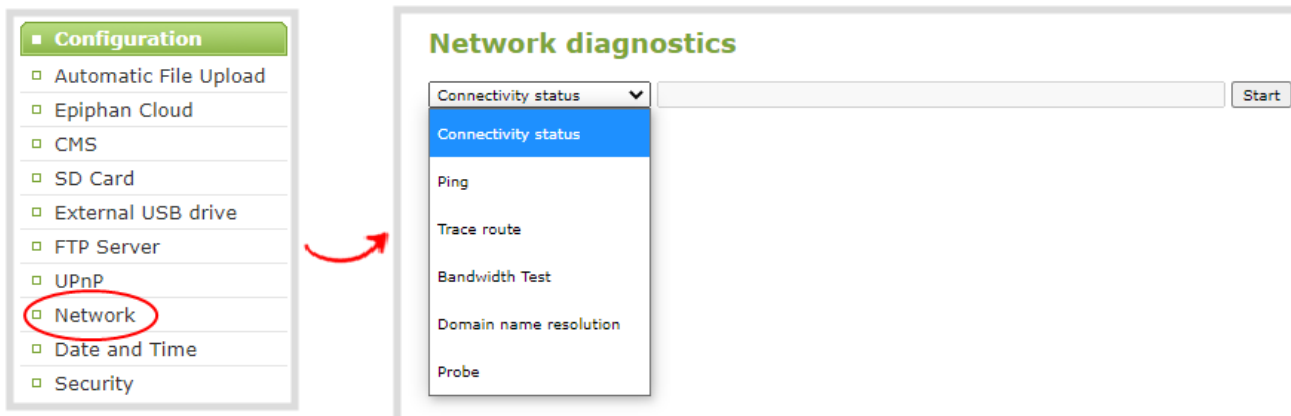
Diagnostic tools

Diagnostic tools are available to help you troubleshoot your Pearl Nano setup and network connection. You can run them using the Admin panel. The Connectivity status diagnostic is also available using the front screen menu, see .

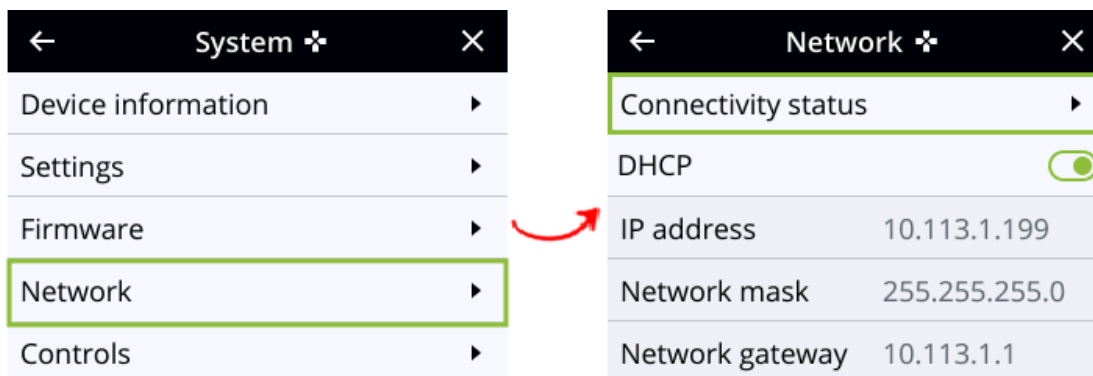
Available diagnostic tools:

- **Connectivity status:** Display the status of critical network connections and features like 802.1x, see [Connectivity status results](#).
- **Ping:** Test if Pearl Nano 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 Nano 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 Nano 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](#).



The Connectivity status diagnostic tool can also be accessed from the front screen menu when you select **System > Network > Connectivity status**.



The following table describes what the colored icons in the results indicate.

Table 69 Diagnostic test result icons

Icon	Description
	The diagnostic test result is ok. This can also mean that a specific feature is enabled on Pearl Nano.
	The feature or option is disabled on Pearl Nano.
	The diagnostic test result is not ok. An error was detected.

Connectivity status results

The following table describes the Connectivity status diagnostics results shown on the front screen and the Admin panel.

Table 70 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 Nano. Status results include: disabled, authenticated, in progress, and failed.
DNS	Check if Pearl Nano can resolve host names with their associated IP address using the DNS server that is configured for Pearl Nano. For information about setting a DNS server IP address for Pearl Nano, see Configure a static IP address .
Captive portal	<p>Check for connectivity issues caused by a Captive portal. An Ok result can indicate several conditions:</p> <ul style="list-style-type: none"> • No captive portal is detected and Pearl Nano can successfully reach the Internet. • A captive portal is detected and Pearl Nano can successfully reach the public Internet.
Internet	Check if Pearl Nano 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 Nano can establish communication with the server. A successful connection is required to use the Epiphan Cloud remote login feature.

Diagnostic	Description
Epiphan Cloud™	Check if the Epiphan Cloud remote management feature is disabled on Pearl Nano and if Pearl Nano can successfully connect to Epiphan Cloud.
Public IP	Display the public IP address of this Pearl Nano. Knowing the public IP address is useful when configuring SRT on Pearl Nano, especially if Pearl Nano 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 Nano 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 Pearl Nano 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 Nano 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 Pearl Nano can resolve a Fully Qualified Domain Name (FQDN) using the DNS server that is configured for Pearl Nano.

- **Probe:** Check if Pearl Nano 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 Nano 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 Nano or contact Epiphan support.

For more information about diagnostic tools, test results, and how to run the Connectivity status diagnostic from the front screen menu, see [Diagnostic tools](#).

Run diagnostics using the Admin panel

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

Troubleshooting Quick Reference

Use the follow quick reference table for help if you are experiencing problems or unexpected behavior from your Pearl Nano.

Table 71 *Troubleshooting Quick Reference*

Problem	Action(s) to Resolve
<p>Not sure if the connected video inputs are being captured.</p>	<p>Check each source's input from the source preview in the Admin panel.</p> <p>OR</p> <p>Use the front screen and control key interface and check the screens for each video input source.</p>
<p>No sound is coming from an audio source.</p>	<p>Verify that you are using the correct audio input by following the steps in Configure encoding.</p> <p>OR</p> <p>Use the front screen and control key interface and check the audio meters or use the 3.5 mm headphone jack on the front of Pearl Nano to verify audio, see Confidence monitoring using the front screen.</p>
<p>Captured SDI audio contains audible "clicking" sound or other audio distortions upon playback.</p>	<p>Ensure audio sample rate is set to 48 kHz. Lower sample rates (i.e. 32 kHz and 44 kHz) can sometimes cause audio distortion.</p>
<p>When previewing a channel using the Live broadcast link or the preview link in the Admin panel, some web browsers do not play audio.</p>	<p>The Flash (FLV) plugin must be installed for your web browser to play back audio that's encoded as PCM.</p> <p>Web browsers that use Flash players to preview video do not support audio that's encoded using 48 kHz MP3 or 48 kHz PCM.</p>
<p>All my input names don't look normal in the Admin panel menu after I applied the default preset</p>	<p>Refresh your browser to clear the cache and restore the proper input names displayed in the Admin panel.</p>
<p>Time stamps between Pearl Nano and an RTSP source are not synchronized.</p>	<p>Reconnect your RTSP source to reset desynchronized time stamps. Verify that you are using a local NTP server on your Pearl Nano as a time synchronization server for your RTSP source, see Configure a time server.</p>

Problem	Action(s) to Resolve
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 Nano.	Check if the selected recording format in Pearl Nano 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.
Image quality is poor or insufficient.	<p>The following tips can help improve image quality:</p> <ol style="list-style-type: none"> 1. Ensure the source resolution is used as the output or recorded resolution. 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.	<p>The following tips can help improve frames per second (fps):</p> <ol style="list-style-type: none"> 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.
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 .

Problem	Action(s) to Resolve
	<p>If you still cannot see the stream, try disabling your local computer firewall.</p> <p>If the issue is still not resolved, contact Epiphan Support at support@epiphan.com.</p>
<p>The stream interrupts or the image breaks up.</p>	<p>The following tips can help diagnose image problems:</p> <ol style="list-style-type: none"> 1. Ensure the source resolution is used as the output or recorded resolution. 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.
<p>The video streamed to my set-top box is dropping frames.</p>	<p>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.</p>
<p>Recording won't start.</p>	<p>If recording will not start, check the Disk Status Information to see if the system is out of storage space. See Storage capacity and maintenance and Manage recorded files.</p>
<p>AFU to my CIFS server doesn't work.</p>	<p>Pearl Nano supports Automatic File Transfer (AFU) to CIFS servers (also known as SMB or samba) with samba version 1.</p>
<p>Firmware upgrade fails.</p>	<p>Reboot the system and try again. If the problem persists, contact Epiphan support at support@epiphan.com.</p>
<p>Certain Media players won't play encoded videos but others will.</p>	<p>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:</p> <ol style="list-style-type: none"> 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.

Problem	Action(s) to Resolve
	<p>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.</p>
<p>Certain Media players won't play MOV videos.</p>	<p>Some media players won't play MOV videos that are recorded with MP3 audio encoding, including:</p> <ol style="list-style-type: none"> 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. <p>Choose a different audio encoding when recording MOV files or use a different media player to playback the recording.</p>
<p>There's no audio when I playback an MP4 file in QuickTime 10.</p>	<p>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.</p>
<p>I can't hear the audio in VLC or the video won't play.</p>	<p>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.</p> <p>VLC version 3.0.6 (windows) won't play MP4 fragmented video files. This is a VLC issue.</p>
<p>There's noticeable latency on the video output port.</p>	<p>Disabling the audio on the video output port improves latency for the port, see Disable or enable audio and output port volume.</p>
<p>System is not starting up correctly.</p>	<p>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.</p>
<p>I can't register my Pearl Nano with Kaltura using the same device name that I just deregistered.</p>	<p>If you deregister Pearl Nano 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 Nano entry in the list of encoder devices disappears before registering again using the same device</p>

Problem	Action(s) to Resolve
	name.
My login attempt to create an ad hoc event from Pearl Nano was denied.	Kaltura or Panopto has denied you access to create unscheduled ad hoc recordings and webcasts using Pearl Nano. Contact your CMS administrator to either activate your CMS account or enable the necessary access rights.

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 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](#).

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)

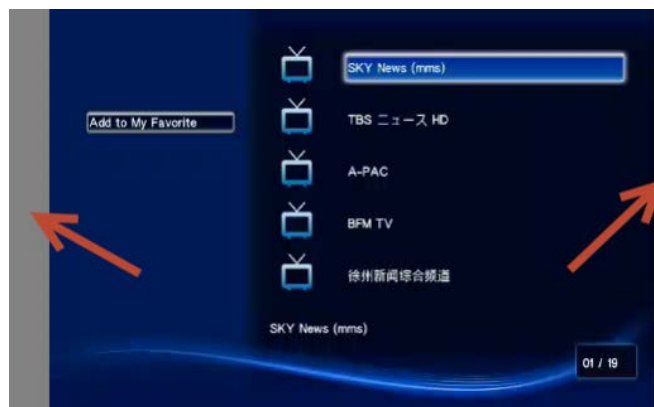
Borders are added to the top and bottom of the image to preserve the wider ratio of the input.



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.

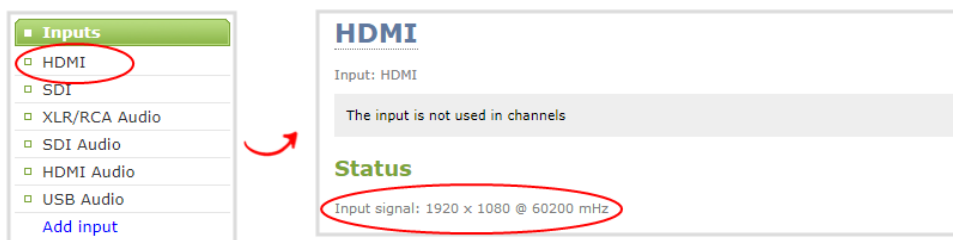


Match output frame size with aspect ratio of input signal

The output frame size is automatically matched only for a layout that has one source. If you have a layout with multiple video sources and see bars on the output but would rather have the image fill the whole screen, 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 Admin panel](#).
2. To determine the input port name of the video source that's used in the channel, select the channel from the Channel menu and click **Layout**. 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 Channel 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**.

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 Pearl Nano, 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 Pearl Nano have a factory set EDID. When you connect a video source such as a laptop or camera to Pearl Nano, the video source sees Pearl Nano 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 Pearl Nano.

Usually, the video input ports on Pearl Nano 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 Pearl Nano, you can force the port to supply a specific resolution, color depth, etc to the connected video source.

Upload a new EDID

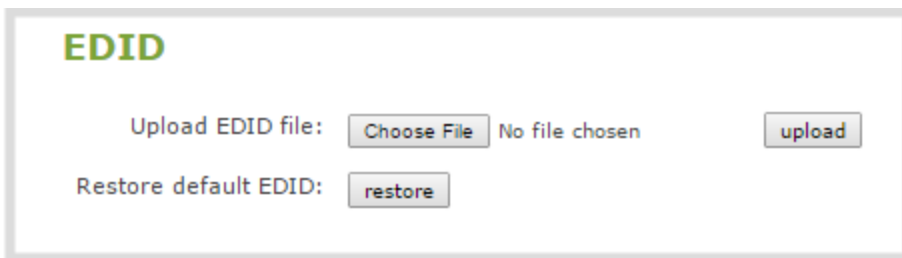
In most cases, the factory installed default EDID works fine for sources connected to the HDMI ports on Pearl Nano. However, there may be times when a connected video source uses resolutions that you do not want to use. In that case, you can manually upload an EDID and force Pearl Nano to use a specific 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.

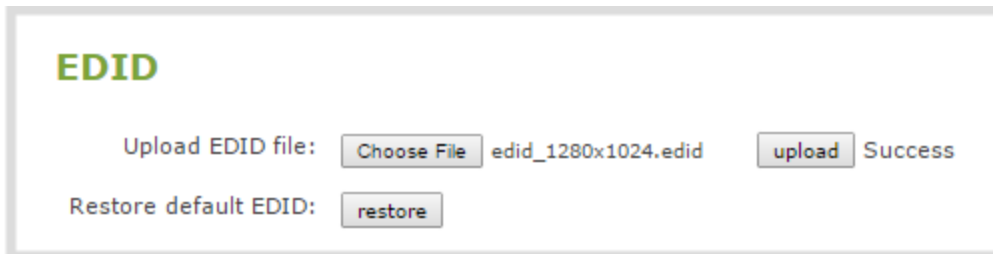
 This feature is not available using the local console on Pearl Nano.

Download a new EDID file using the Admin panel

1. Go to the [Epiphan support](#) web page and select the support page for Pearl Nano.
2. Scroll to the **EDID** section and select an EDID from the list. The file is saved to your downloads folder on your hard drive.
3. Connect to the Admin panel and log in as **admin**. See [Connect to Admin panel](#)
4. From the Inputs menu, select the input port for which you want to upload the EDID.
5. On the configuration page for that source, scroll to the **EDID upload** section and click **Choose File**.



6. Browse to the location where the custom EDID file was saved and select it, then click **open**.
7. Select **upload**. When the upload is complete, the page updates to reflect success or failure.

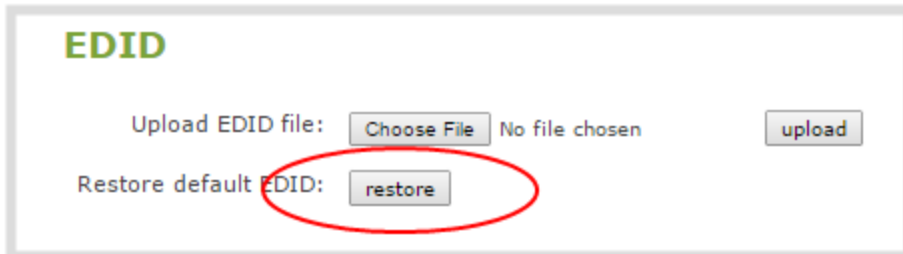


Restore factory default EDID

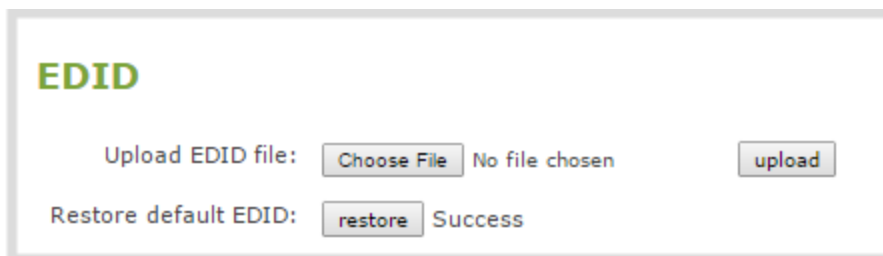
When you no longer want a custom EDID assigned to an input port, you can restore the input port to use the factory default EDID. Currently there is no way to tell if your input port is using a custom EDID. If you are unsure, restoring to factory default is the best approach.

Restore the default EDID using the Admin panel

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



Previous releases and features

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

Release 4.14.0

- Inaugural release of Pearl Nano.

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"Agreement" means this Epiphan Systems Inc. Software License;

"API" means an application programming interface;

"Documentation" means the technical publications delivered to You with the Software relating to the installation and operation of the Software and/or Hardware, such as reference, user, installation and technical guides and release notes;

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February 26, 2021

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Important Safety Warnings

Model numbers covered by this document: ESP1442, ESP1474, ESP1556, and ESP1610

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 Nano

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
116 University Avenue, Suite 100
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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