FMG-400 Media Gateway Card User Manual

Kiloview Electronics Co., Ltd

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1 Product Overview

FMG-400 is a high-performance media gateway card designed for Cradle Series RF02. Media gateway is an important component in AV-over-IP workflows, enabling protocol and codec conversion between different video/audio formats, while providing high-bandwidth, high-concurrency streaming distribution to end users.

The FMG-400 supports two modes: Gateway Mode and Bonding Mode.

Gateway Mode: It enables conversion and distribution across multiple video codecs (such as H.264, H.265, Speed HQ) and protocols (NDI®|High Bandwidth, NDI®|HX 2/3, SRT, RTMP, RTSP, RTP, TS over UDP, and HLS).
Users can configure protocol-only, codec-only, or both. After conversion, the FMG-400 supports up to 50 concurrent output streams(subject to total system bandwidth).

Bonding Mode: It is an extended feature specifically designed for the RF02. The RF02 can receive bonded streams from Kiloview P series 5G/4G wireless bonding encoder. To output these bonded streams in different protocols (such as NDI®|HX or SRT and so on), the FMG-400 is required for conversion.

Bonding Mode and Gateway Mode can operate simultaneously.

With deep integration into the RF02, multiple FMG-400 cards can be centrally managed through a RF02 interface, covering stream input/output, conversion, and distribution. This significantly simplifies system operation and maintenance while delivering scalable, high-density media processing capabilities.

2 Product Features

2.1 Comprehensive Protocol and Codec Support.

Input/Output Streaming Protocols: NDI®|High Bandwidth, NDI®|HX2/3, SRT, RTMP, RTSP, RTP, TS-over-UDP, HLS.

Video Codecs： H.264/AVC, H.265/HEVC, SpeedHQ (NDI®|High Bandwidth).

Audeo Codecs: AAC, PCM, G.711（support for additional codecs can be expanded）.

2.2 Flexible Media Processing and Format Conversion

Supports configurable conversion of video codecs, resolution, frame rate, and video bit rate, as well as audio format, sampling rate, channel count, and audio bit rate.

Enables upscaling and downscaling of resolution and frame rate.(Note: Due to processing performance limitations, 4K video supports downscaling only)

2.3 Free Protocol Conversion and High-Concurrency Distribution

The FMG-400 allows flexible conversion one input streaming protocol to one or multiple output protocols. For example, input SRT stream can be converted and output simultaneously as NDI High Bandwidth and NDI HX.It also supports SRT in and out, enabling up to 50 concurrent distribution connections to end users.

2.4 “Source-to-Destination” Switching Based on Crosspoint Architecture

The FMG-400 provides a crosspoint control mode similar to matrix. Operators can quickly switch video sources to outputs by simply clicking on the crosspoint control panel, streamlining signal routing and switching workflows.

2.5 Localized Stream Conversion Output for Kiloview P Series 4G/5G Bonding Encoders

In Bonding Mode, the FMG-400 works with the RF02 to provide a scalable stream forwarding service, supporting bonded stream reception and redistribution for up to 8 Kiloview P Series devices.

3 Product Applications

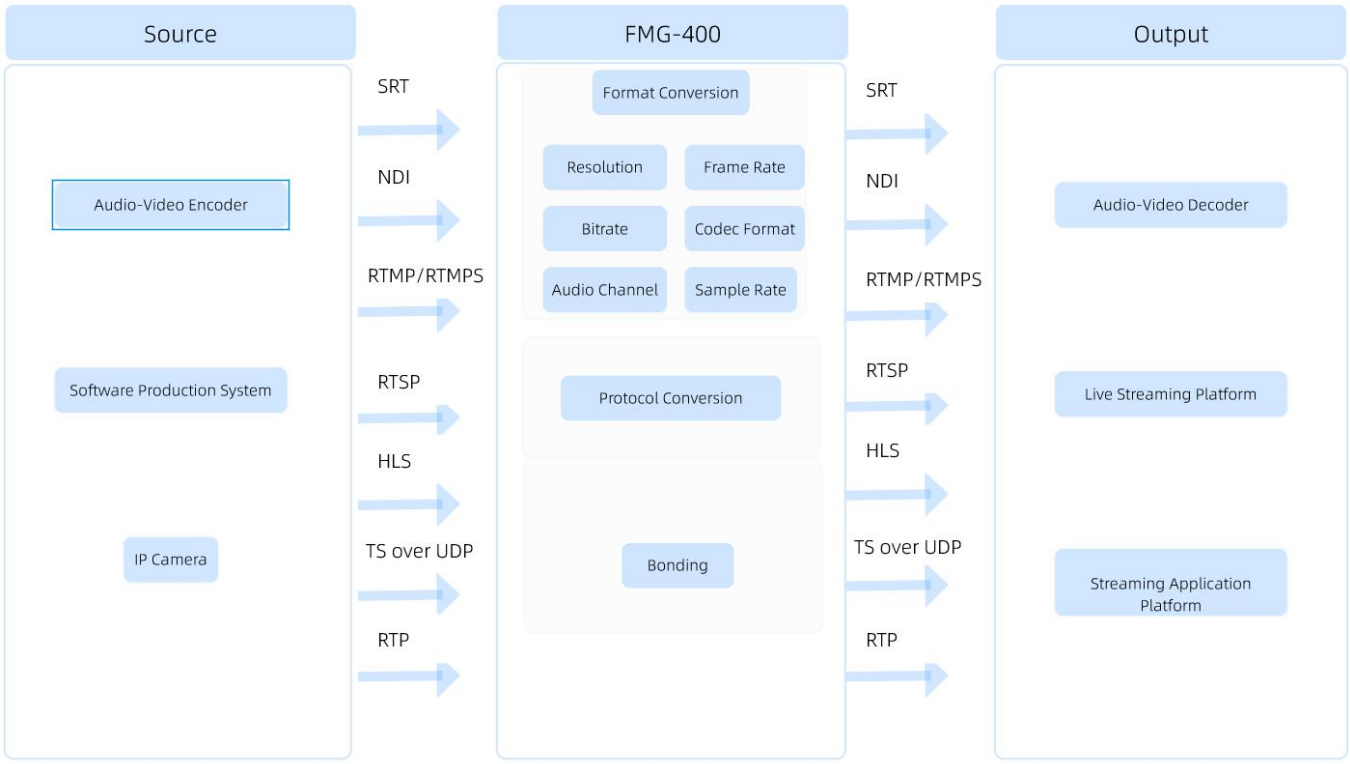


Figure: Typical Application Topology of the FMG-400

*This diagram illustrates the complete workflow of the FMG-400, from receiving multi-protocol signals from production networks, the internet, and mobile networks, through conversion and distribution, to delivery across various endpoints and platforms.

4 Product Specifications

Product Specifications	
Streaming Protocol Input/Output	NDI®|High Bandwidth, NDI®|HX, SRT, RTMP/RTMPS, RTSP, RTP, TS-over-UDP, HLS
Video Decoding Formats	H.264, H.265, SpeedHQ (NDI High-Bandwidth)
Audio Encoding and Decoding Formats	NDI PCM Audio， Linear PCM， AAC-LC/AAC-LD/AAC-HE， ITU-T G.711 (aLaw/uLaw)； Opus（only support decode）， MPEG Audio Layer3 (MP3)（only support decode）， MPEG Audio Layer2 (MP2)（ only support decode）
H.264 Specification	Encode：H.264 (High/Main/Baseline Profile @ Level 5.1) Decode：H.264/AVC(BP/MP/HP@level 6.0)
H.265 Specification	Encode：H.265（High/Main/Baseline Profile Main Tier @ Level 4.1） Decode：H.265/HEVC（Main/Main10 profile@Level6.0 High-tier）
SpeedHQ Specification	SHQ0 (YUV4:2:0), SHQ2(YUV4:2:2), SHQ7(YUV4:2:2:4)
Network	Adaptive 10/100/1000 Mbps
Power	Powered by the RF02 platform
Consumption	≤ 10 W
Temperature	Operating Temperature: −20°C to 50°C; Storage Temperature: −20°C to 70°C; Relative Humidity: 5% to 90% (non-condensing)
Management Method	Supports Web UI access and centralized management via the RF02 platform
Size	324.90 mm (L) × 76.84 mm (W)　[Standard 2RU card]
Weight	≈ 500 g

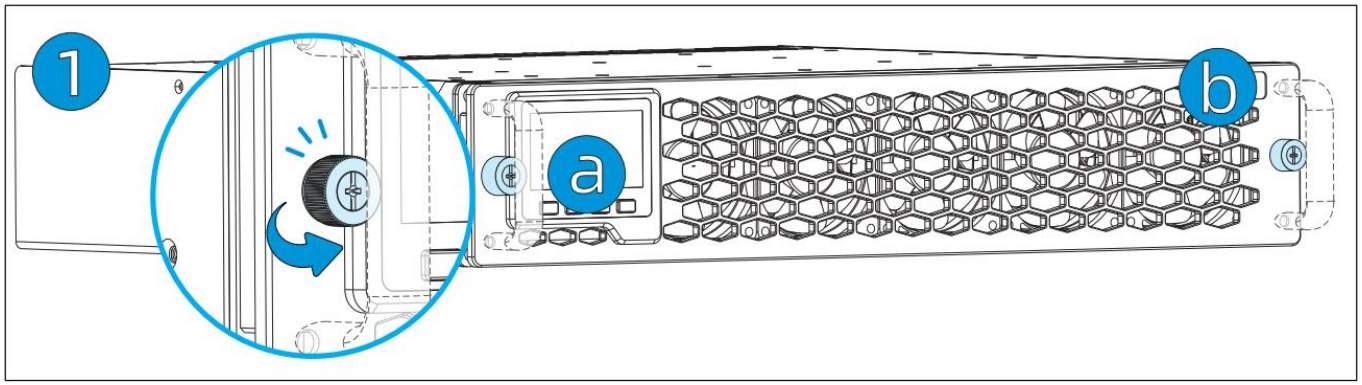
2 User Guide

- Device Installation and Connections
- Network Connection and Configuration
- Device Overview and Interface Description
- Operating the Device

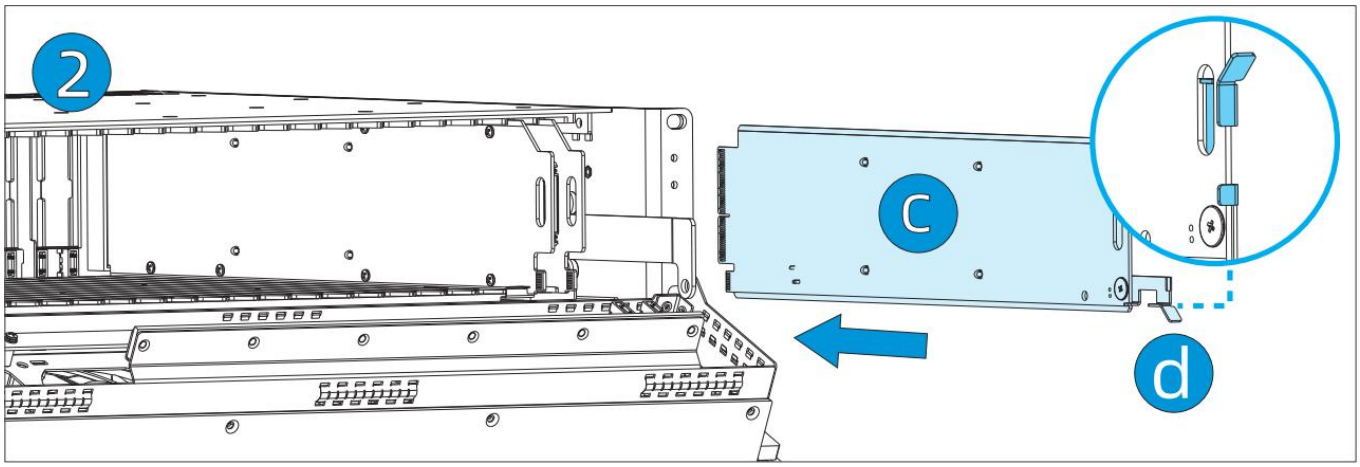
3 Device Installation and Connection

3.1 Device Installation and Connection

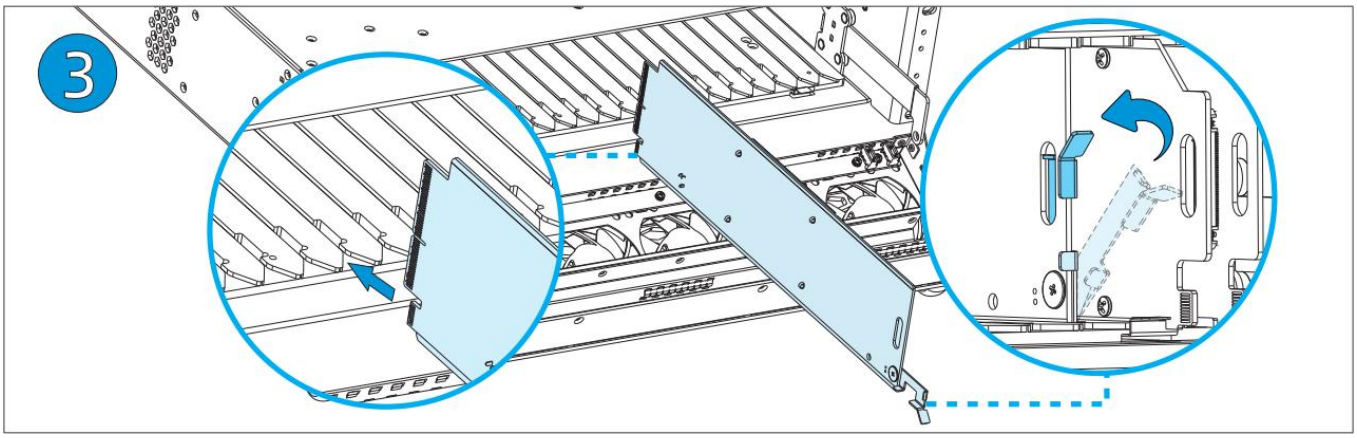
Step 1: Loosen the two hand-tightened screws (a and b) on the RF02 front panel , then open the chassis.



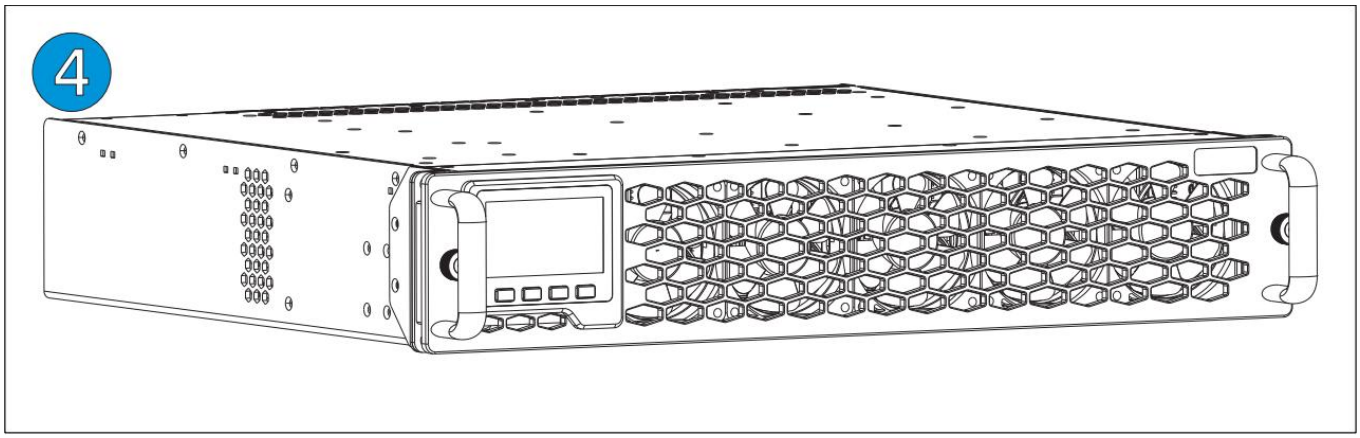
Step 2: Slide the metal latch (d) on the FMG-400 card (c) to the right , then downward to release it.



Step 3: Align the Card Assembly (c) with the chassis slot (with the short-pin gold fingers facing downward), push it in horizontally until fully seated, push the metal latch upward, then slide it to the left to lock it in place, and close the front panel.



Step 4: Tighten the two hand-tightened screws (a and b) to complete installation.



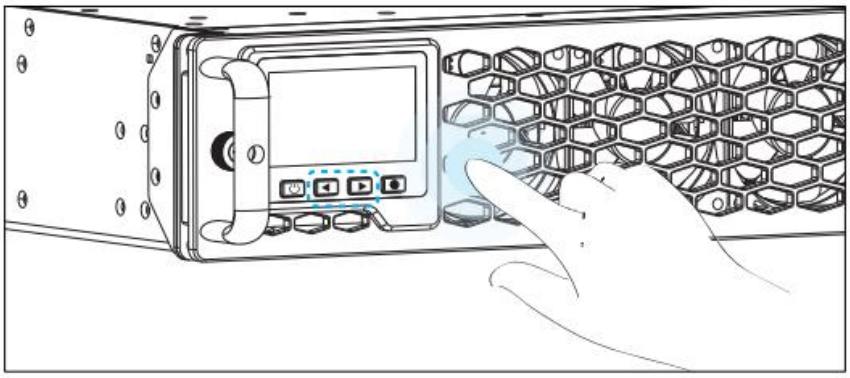
For removal: Loosen the two hand-tightened screws on the RF02 front panel, release the metal latch (d), then pull the assembly out parallel.

3.2 Network Connection

The FMG-400 automatically obtains an IP address from the RF02 device.

3.3 Device Discovery

When using the FMG-400 for the first time, after inserting the FMG-400 card into the RF02 chassis and completing startup, the FMG-400 cardboard will automatically obtain an IP address via the DHCP service. The IP address can be viewed on the LCD screen of the RF02 front panel. To view all FMG-400 cards connected to the RF02, use the '< ' and ' >' buttons below the LCD screen on the RF02 front panel to navigate to the device list information interface.

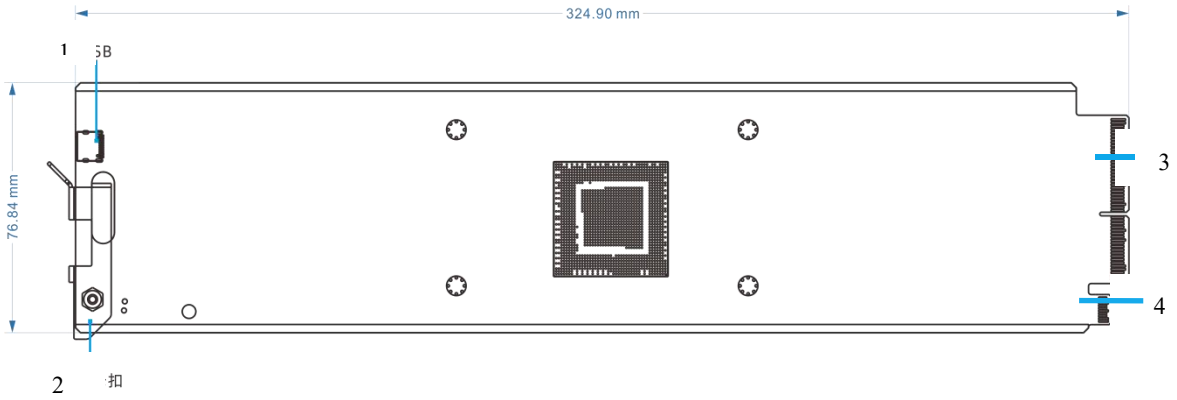


4 Device Overview and Interface Description

4.1 Package Contents

Item	Unit	Quantity
FMG-400	unit	1
User Manual	copy	1
Product Certificate & Warranty Card	copy	1

4.2 Interface Description



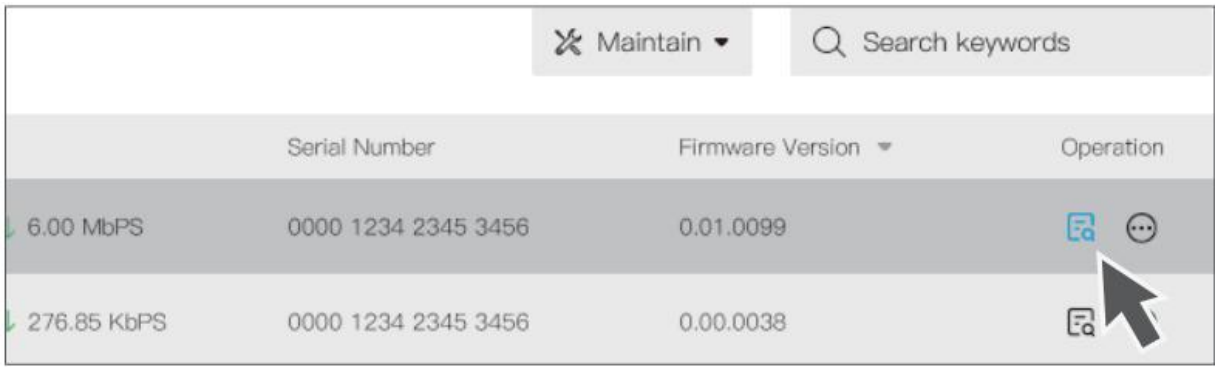
1. USB-C 2.0	2. Metal Retaining Clip	3. 64pin Gold Finger Connector	4. 10pin Gold Finger Connector

- USB Port: Used for internal development and debugging.
- Metal Retaining Clip: Used for secure installation and mounting of the device.
- 64-pin Gold Finger Connector: Provides functional expansion capabilities.
- 10-pin Gold Finger Connector: Supplies power and enables network communication.

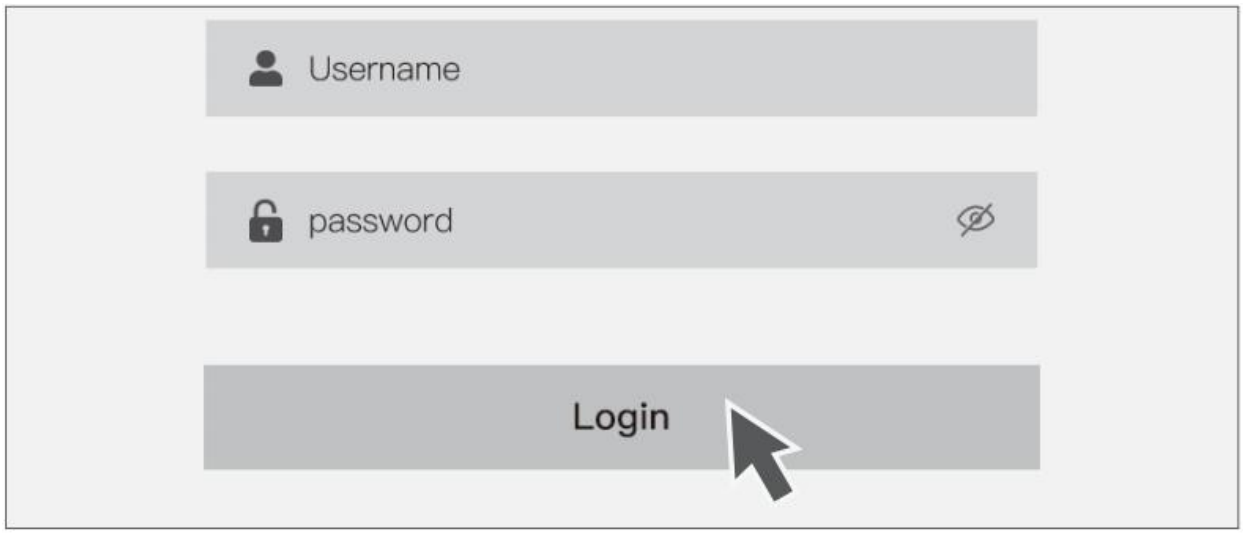
5 Device Web Management

5.1 Accessing the Management Interface via Web Browser

In addition to using the RF02 for centralized device management, the FMG-400 card also supports individual management via WEB interface. To access the FMG-400 management page, simply enter http://device ip address/ in the browser address bar. After normal startup of the FMG-400, enter the RF02 chassis management IP address in the browser address bar to log in to the RF02 device management platform. The FMG-400 business card management backend can be accessed without a password from the "Manage" section on the homepage.



Additionally, you can also choose to enter the FMG-400 management IP address in your browser and log in to its own management backend by entering its username and password.



Note

- The default login username and password are both "admin".
- For information security, it is recommended to change the password immediately after the first login.
- For security reasons, it is strongly recommended that you perform the following action immediately after the first login: Go to Settings > User Management and change the default password of the admin account.

6 Add source and output

6.1 Source (Add Network Source)

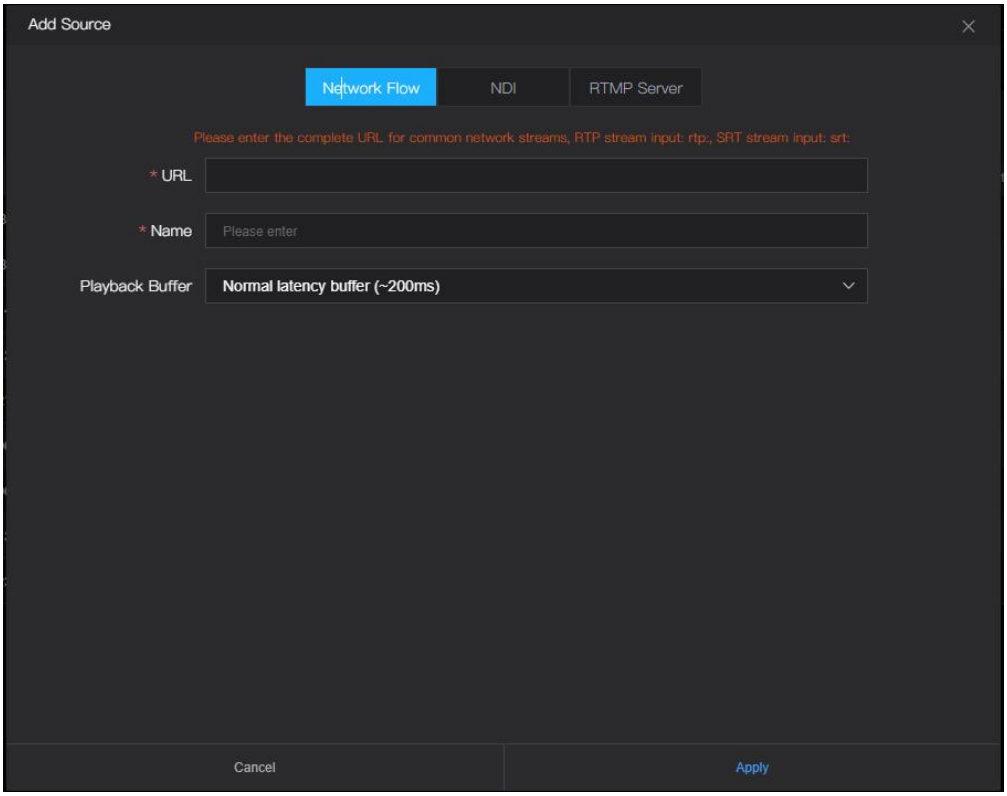
On the FMG-400 page , click the " Source " button . " Source" is divided into two groups :Online AV Source and Bonding AV Source . The Online AV Source mainly consists of three parts: Add Network Flow ; NDI ; and RTMP Server. The Bonding AV Source is the private Kilolink source automatically Generated when adding P-series devices to the RF02 .

6.1.1 Add source

It supports multiple protocols such as RTSP, SRT , RTMP /RTMPS , UDP, RTP, HLS , RTMP Server, NDI HX , and NDI HB , and the device can automatically recognize the URL address .

6.1.1.1 Add RTSP video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box, enter "rtsp:". The configuration parameters corresponding to the RTSP protocol will automatically pop up. After configuring the relevant parameters, click "OK" to add a video source.



The parameters of the RTSP source are defined as follows:

- URL: After entering the URL address, if there are advanced parameter configurations,a dialog box will automatically pop up to configure the corresponding parameters. You can also click on the various protocol options on the page to directly configure the parameters in detail.
- Name: Can be configured arbitrarily, supporting combinations of English, and numbers;
- Transmission method: Configurable to TCP or UDP. TCP is a reliable transmission protocol, while UDP is an unreliable transmission protocol.

- Username and password : Configured based on whether the video source requires user authentication; generally, this is not required.
- Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s, 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters are suitable for good networks, while higher latency parameters are needed for poor networks.

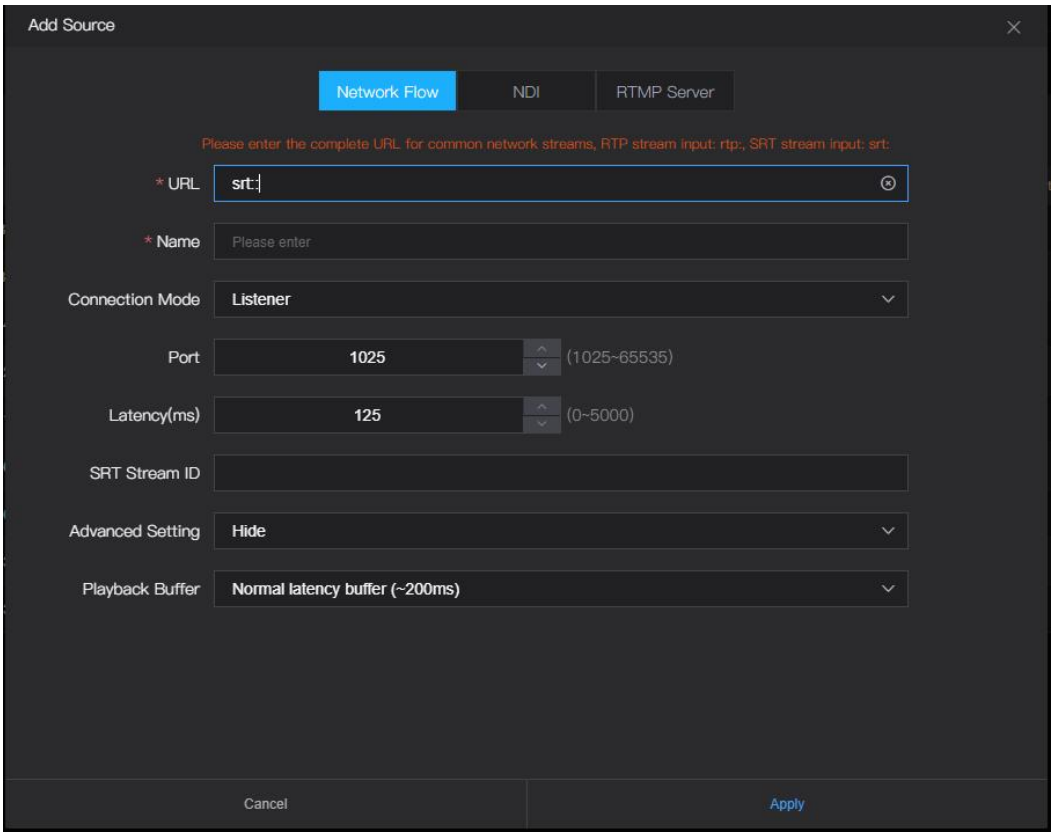
The image above shows how to add a video source using an RTSP source as an example. The steps for adding other types of video sources are the same. Please refer to the table below for relevant parameters.

The parameters of the video source are defined as follows:

Name	The video source name can be set arbitrarily and supports a mix of English
URL address	It supports multiple protocols including RTSP, RTMP , RTMPS, NDI, UDP, HTTP, and SRT, and the device can automatically recognize the URL address. After entering the URL address, if there are advanced parameter configuration options, a dialog box will automatically pop up to configure the corresponding parameters. Alternatively, you can click on the protocol options on the page to directly access detailed parameter settings.
Transmission method	It can be configured to use TCP or UDP. TCP is a reliable transport protocol, while UDP is an unreliable transport protocol.
Username/Password	Configure based on whether the video source has user authentication; generally, no configuration is needed.
Buffering and Delay	To address various application scenarios and network conditions, the device offers multiple buffering strategies for users to choose from, balancing real-time decoding performance with smoothness. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, and 1s. Users can select based on their actual network conditions; lower latency parameters are suitable for networks with good performance, while higher latency parameters are needed for networks with poor performance.

6.1.1.2 Add SRT video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box , enter "srt:" and the relevant parameters for the SRT source will automatically appear. Configure the corresponding parameters and click "OK" to add an SRT source.

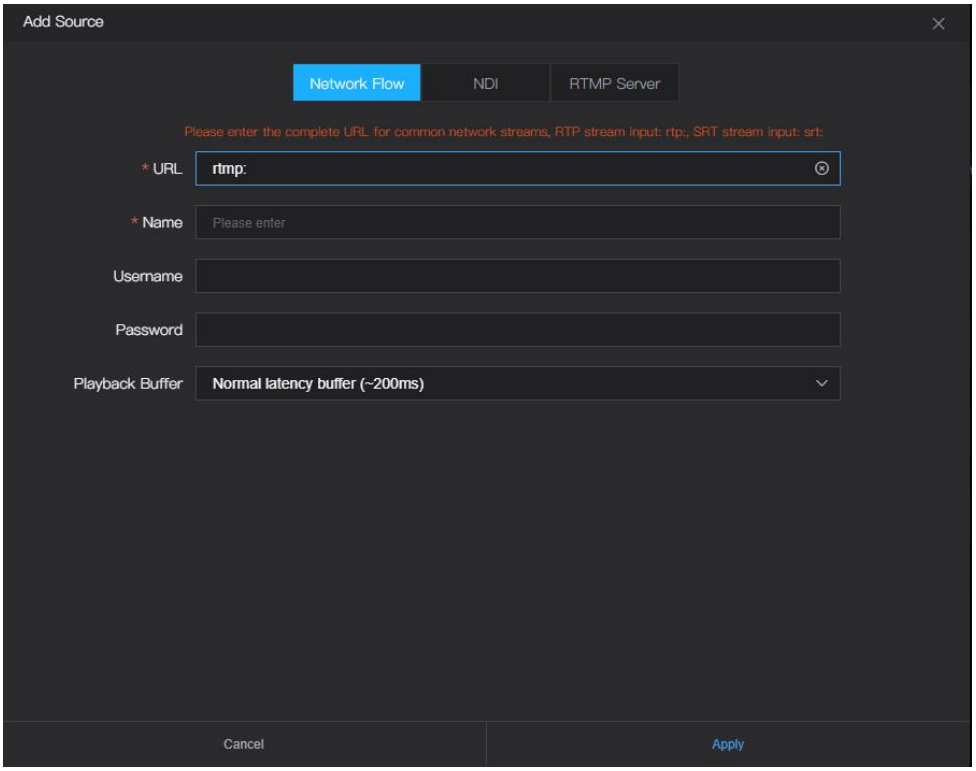


The parameters of the SRT source are defined as follows:

- Name: Can be configured arbitrarily, supporting combination English, and numbers;
- Encryption method : Configured based on whether the video source has user authentication; generally, no configuration is required .
- Public IP address: When using CALLER mode, the URL address format is: srt://peer's public IP address; when using Listener mode, which listens on a public IP address, this does not need to be filled in.
- Port: Configure a listening port, which must be the same as the sender's port;
- Transmission delay: This is set based on the performance of the current network link. The delay can be set at both the SRT source device and the SRT target device. The larger of the two values will be taken as the SRT transmission delay.
- Encryption methods: Supports three encryption modes: AES-128, AES-192, and AES-256;
- Key: Encryption key, a 10-79 character combination of letters or numbers depending on the encryption method;
- Bandwidth Overhead: A percentage value set based on network link quality. Multiplying this percentage by the total bitrate of the audio and video encoded by the encoder yields the maximum bandwidth allowed for Bandwidth Overhead. The sum of this value and the audio/video bitrate is the current SRT transmission bandwidth threshold, and also the maximum bandwidth that the SRT stream can use. From an "overhead" perspective, it represents the extra "ineffective" bandwidth used beyond the required media content (payload). However, it differs from common protocol overheads such as TCP header overhead and UDP header overhead. This bandwidth overhead is not a fixed 20-60 bytes for TCP header overhead or 8 bytes for UDP header overhead; it changes in real-time based on network conditions. The worse the network link conditions, the more overhead is required for normal transmission. The setting range is 5% to 100%, with a default value of 25%.
- Payload size : The size of the data packets sent; the receiver should ideally match the same size. The default size is 1316, which is the optimal data packet size for encoding and decoding.

6.1.1.3 Add RTMP/RTMPS video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box, enter "RTMP:" and the relevant RTMP source parameters will automatically pop up . Configure the corresponding parameters in sequence and click "OK" to add an RTMP source.

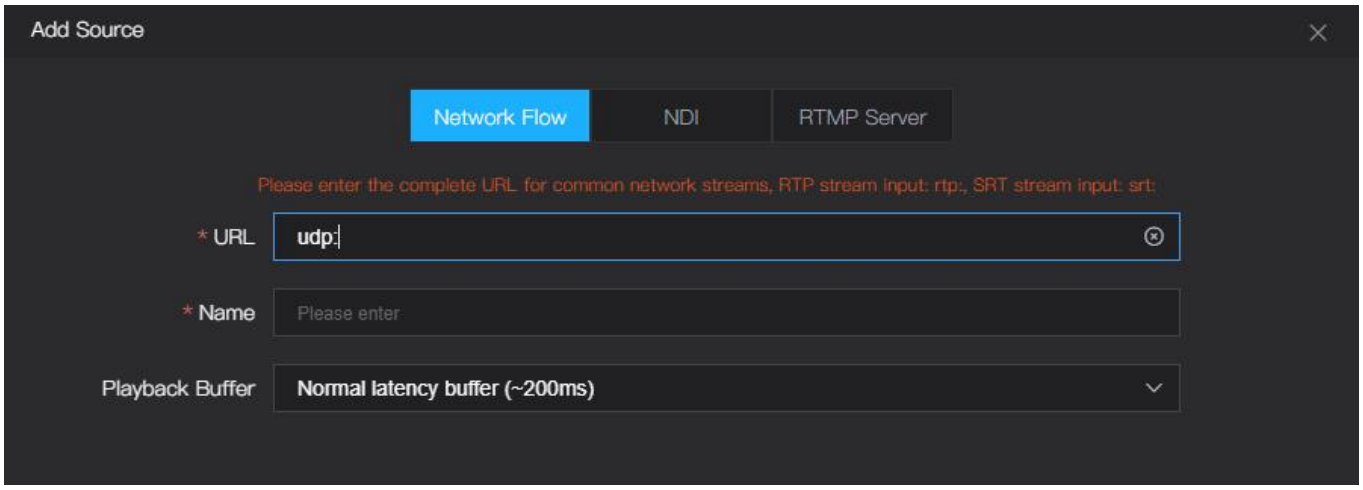


The parameters of the RTMP source are defined as follows:

- URL: After entering the URL address, if there are advanced parameter configurations, a dialog box will automatically pop up to configure the corresponding parameters. You can also click on the various protocol options on the page to directly configure the parameters in detail.
- Name: Can be configured arbitrarily, supporting combinations English, and numbers;
- Username and password : Configured based on whether the video source requires user authentication; generally, this is not required.
- Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s , 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters can be selected for good networks, while higher latency parameters are needed for poor networks.

6.1.1.4 Add UDP video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box , enter " UDP :" and the relevant UDP source parameters will automatically appear . Configure the corresponding parameters and click "OK" to add a UDP source.

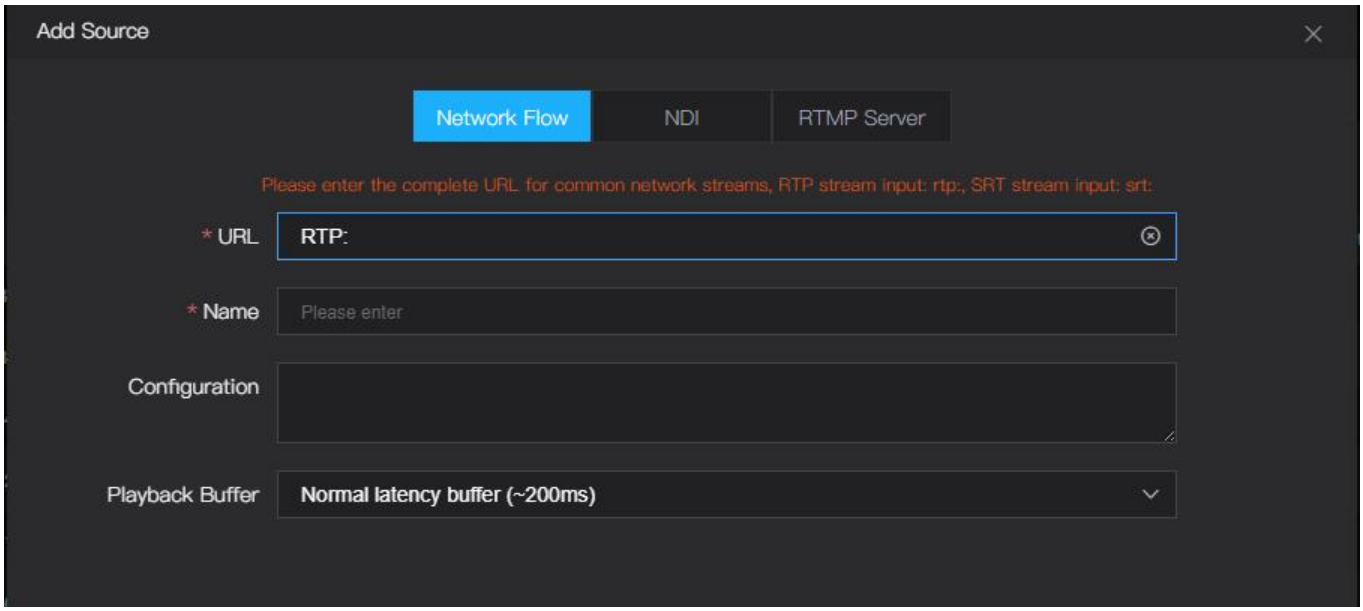


The parameters for the UDP source are defined as follows:

- URL: After entering the URL address, if there are advanced parameter configurations, a dialog box will automatically pop up to configure the corresponding parameters. You can also click on the various protocol options on the page to directly configure the parameters in detail.
- Name: Can be configured arbitrarily, supporting combinations English, and numbers;
- Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s , 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters can be selected for good networks, while higher latency parameters are needed for poor networks.

6.1.1.5 Add RTP video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box , enter " RTP :" and the relevant RTP source parameters will automatically pop up . Configure the corresponding parameters in sequence and click "OK" to add an RTP source.



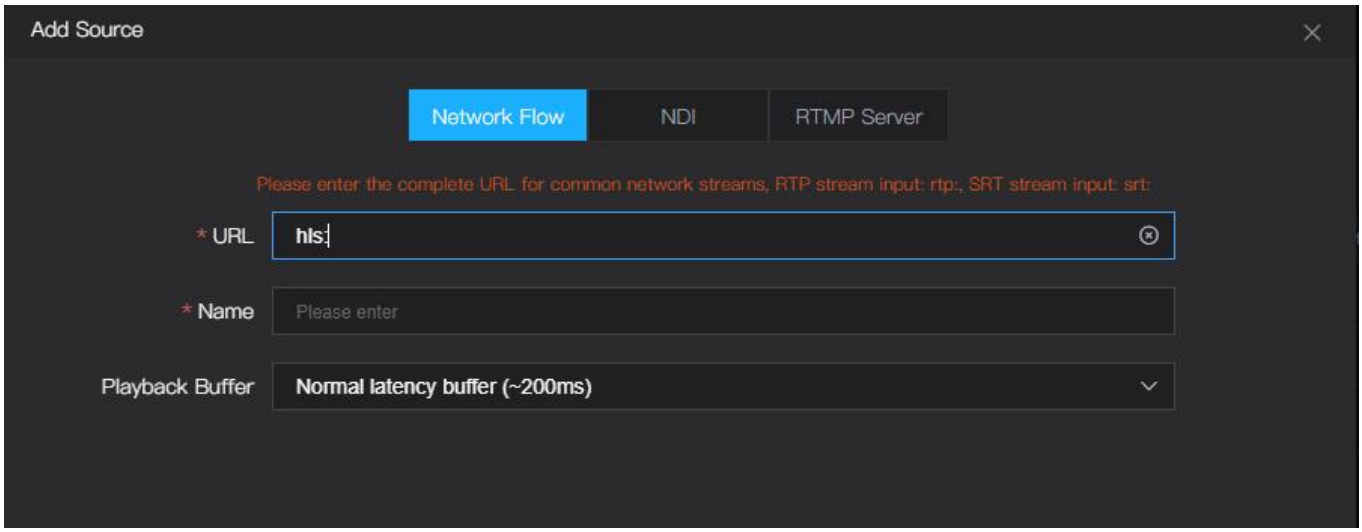
The parameters of the RTP source are defined as follows:

- URL: After entering the URL address, if there are advanced parameter configurations, a dialog box will automatically pop up to configure the corresponding parameters. You can also click on the various protocol options on the page to directly configure the parameters in detail.
- Name: Can be configured arbitrarily, supporting combinations English, and numbers;
- Configuration information: Customizable configuration is available ;

Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s , 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters can be selected for good networks, while higher latency parameters are needed for poor networks.

6.1.1.6 Add HLS video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up dialog box , enter " HLS :" and the relevant parameters for the HLS source will automatically pop up . Configure the corresponding parameters in sequence and click "OK" to add an HLS source.

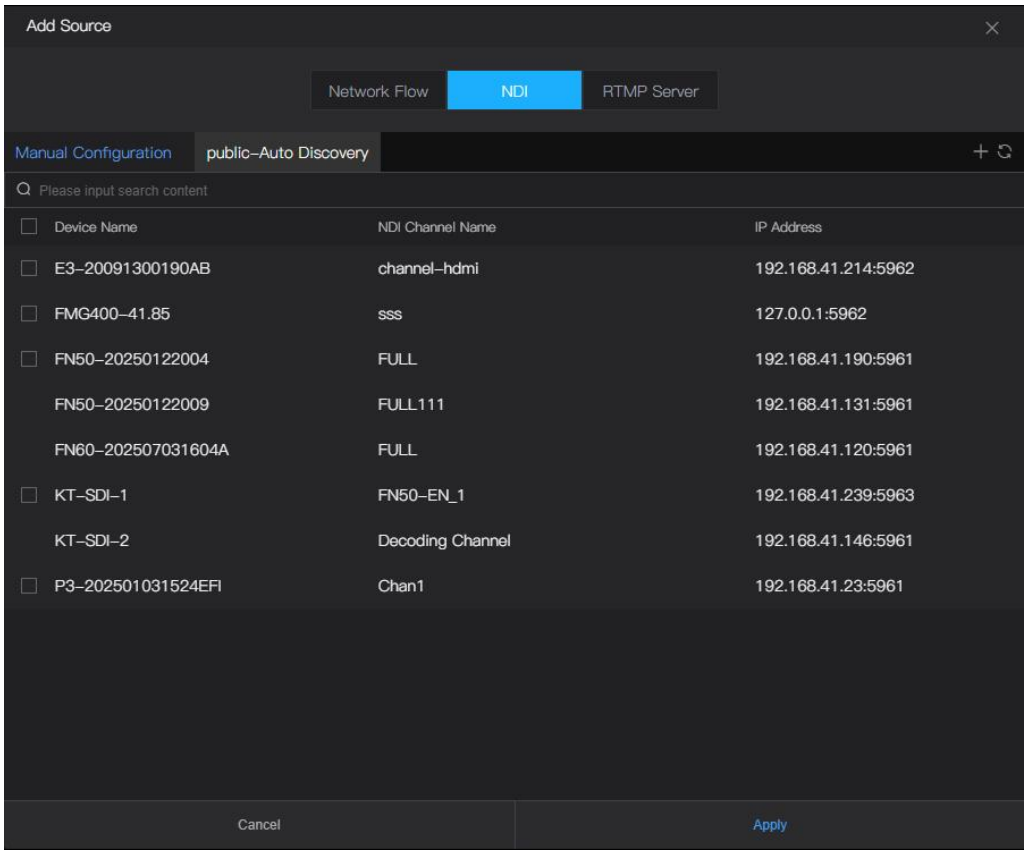


The parameters of the HLS source are defined as follows :

- Name: Can be configured arbitrarily, supporting combinations English, and numbers;
- URL: After entering the URL address, if there are advanced parameter configurations, a dialog box will automatically pop up to configure the corresponding parameters. Alternatively, you can click on the various protocol options on the page to directly configure detailed parameters .
- Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s , 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters can be selected for good networks, while higher latency parameters are needed for poor networks.

6.1.1.7 Add NDI video source

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up window, select NDI . This will automatically display various ways to add NDI sources : automatic discovery and manual configuration.



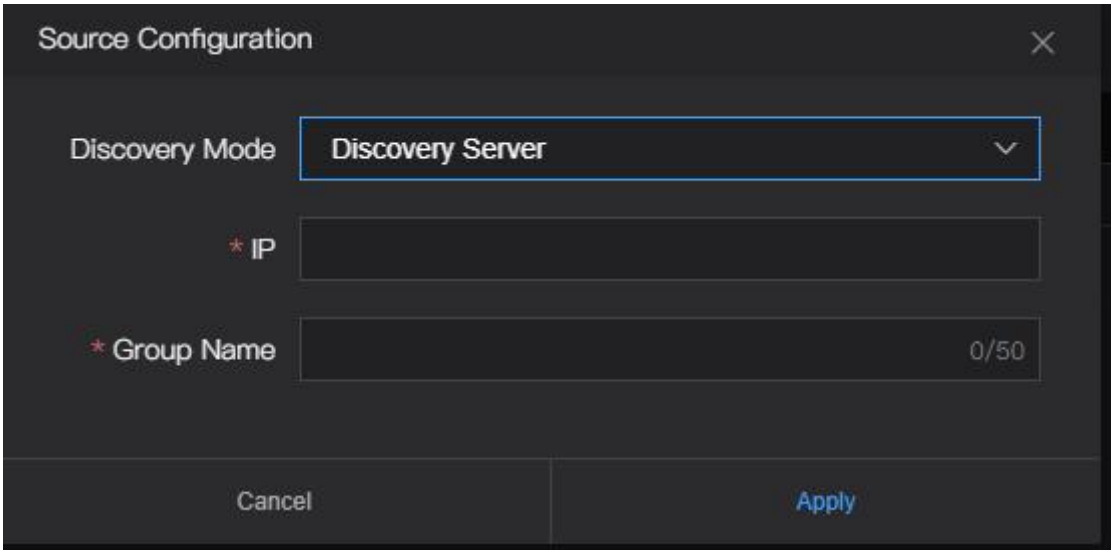
6.1.1.8 Automatically discover and add NDI video sources

On the FMG-400 page, go to " Source " - "Add Source ". In the pop-up window, select NDI , click "Public" - "Auto Discover". This will allow you to discover NDI video sources on the same local area network . You can select one or multiple NDI sources from the list. After that, click "OK" and the video source will be added to the video source list.

To add an NDI source that is not in the public group, you can click the button, enter the "group name" in the "source configuration" pop-up window, and click "OK". This will automatically discover NDI streams from other groups.

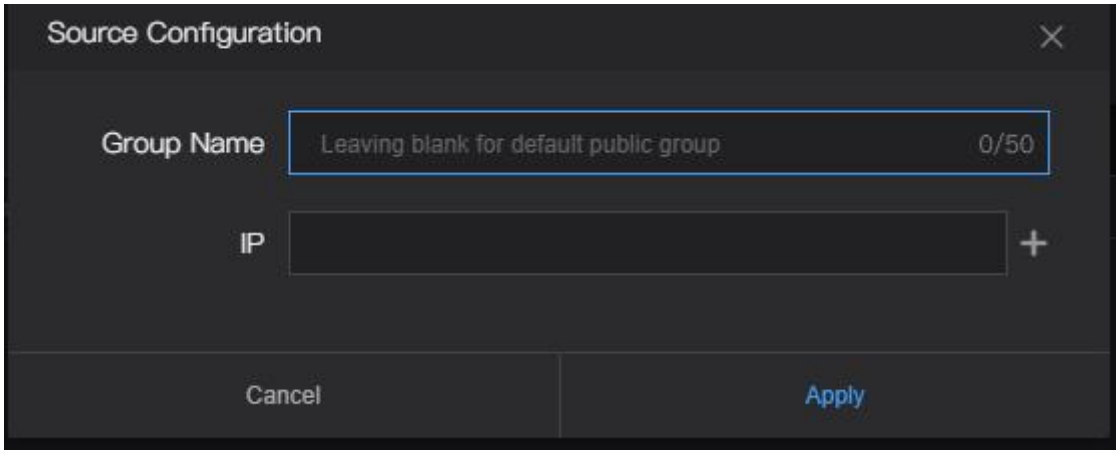
To add an NDI source that is not in the public group and is not a unified IP address, you can click the button, select "Discover Server" in the "Source Configuration" pop-up window, enter the "IP" and "Group Name", and

click "OK" to submit. This will automatically discover NDI streams in other groups on other network segments of the local area network.



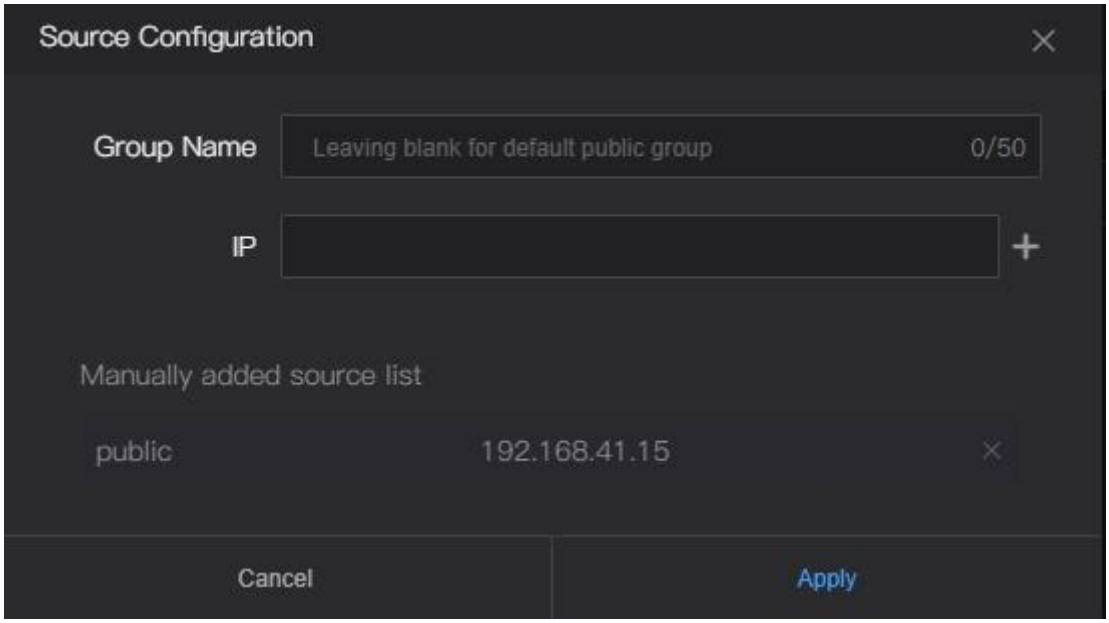
6.1.1.9 Manually configure and add NDI video sources

On the FMG-400 page, go to " Source" - "Add Source". In the pop-up window, select NDI, then click "NDI" - "Manual Configuration" to enter the configuration dialog box . If you want to search for devices with different group names within the same subnet, enter the specified group name (e.g., kiloview) in the "Group" box and press Enter. The "Group" box will then display two group names. Click the "OK" button (no need to enter IP addresses). The device will then search for NDI sources in both group names simultaneously. (You can also add multiple group names to search.)



When you need to search for NDI sources across network segments, if the group name is not a public group, you need to first enter the specified group name, then enter the specified IP address in the "IP" field, and click the button next to it to add the IP address to the "Manual Scan Address List". You can add multiple IP

addresses at once and search them simultaneously, and then click "OK" to save.



3) Manually enter the URL address to add NDI|HX video source

On the device page, go to "Media" - "Add", select "NDI", fill in the corresponding parameters and save.

Name: Can be configured arbitrarily, supporting combinations of Chinese, English, and numbers;

URL address: ndi://source IP address:port, the default port is 5961;

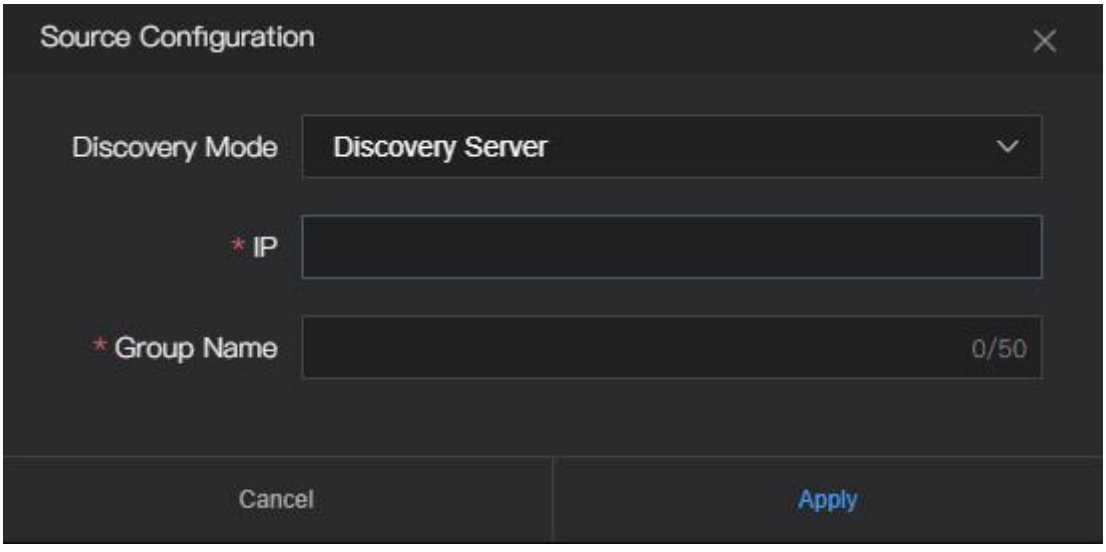
NDI Name: Source Device Name (Channel Name);

Bitstream: You can choose Full (main bitstream) or Preview (sub-bitstream);

Playback buffer: Select the playback buffer according to the actual scenario.

6.1.1.10 How to add an NDI discovery server

An NDI discovery server can replace automatic NDI discovery with a dedicated server. NDI sources are centrally registered with the server, and the receiving end obtains NDI sources from the server. This function can also be configured to send the output video stream to receiving ends across different network segments.

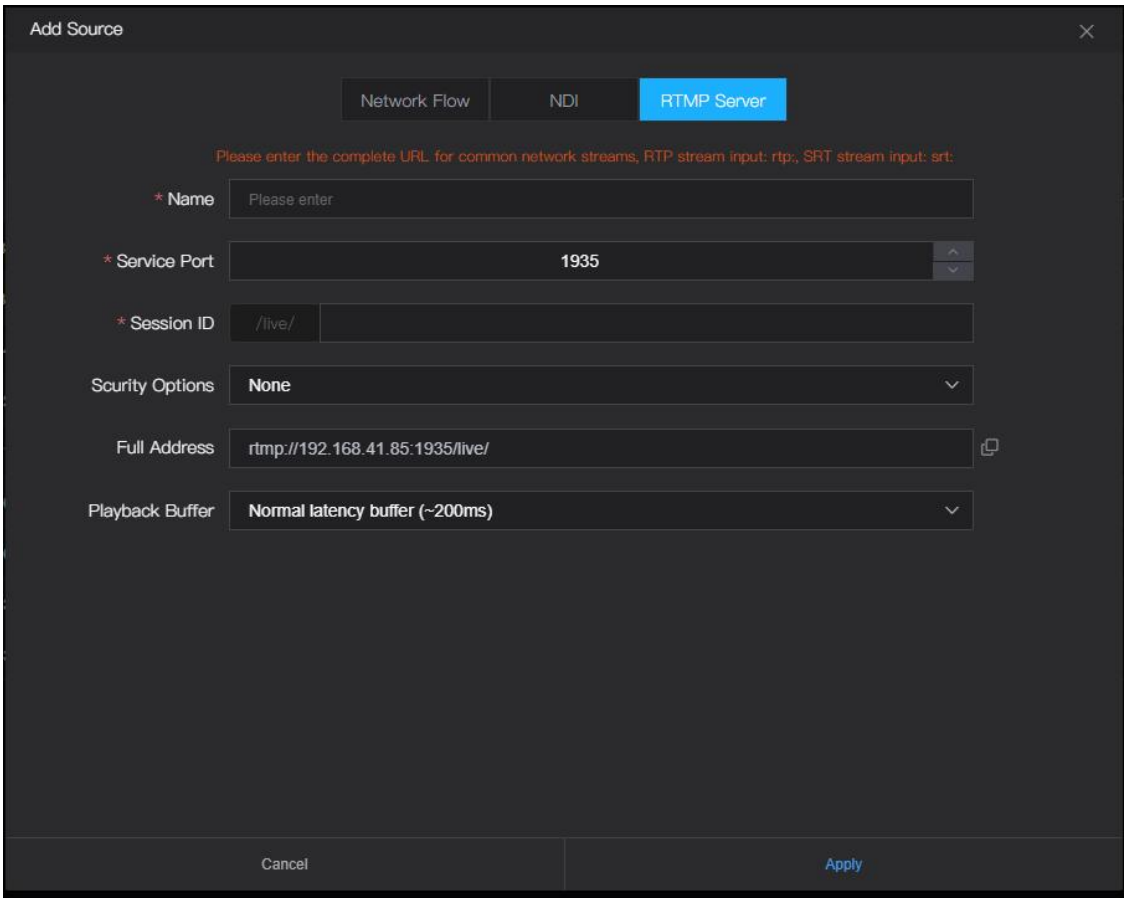


In the NDI encoder, configure the IP address of the computer hosting the discovery server in the discovery server settings. NDI will then register with the server. It is recommended to configure the discovery server address as a static

IP address to prevent NDI connection loss due to IP reassignment.

6.1.1.11 Add RTMP Server Media Server

On the FMG-400 page, go to " Source " - "Add Source ", and select RTMP in the pop-up window. The server will automatically display the relevant media server parameters. Configure the corresponding parameters one by one and then click "OK" to add an RTMP. Server-side application .



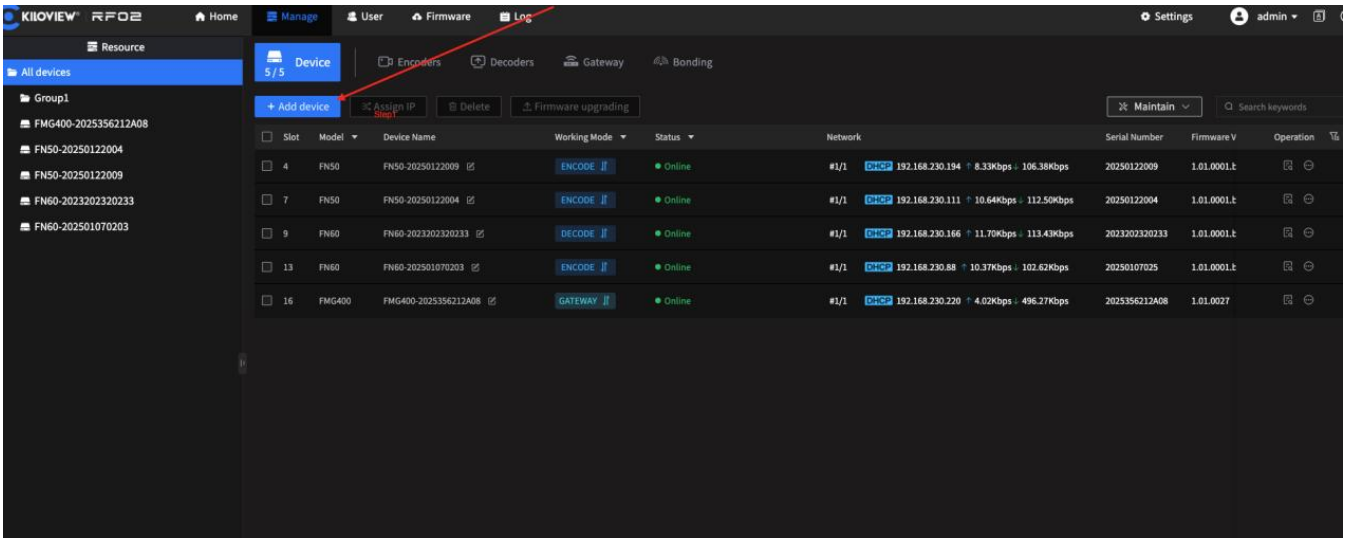
The parameters of the RTMP Server media server are defined as follows:

- Name: Can be configured arbitrarily, supporting combinations English, and numbers;
- Service port: Configure a listening port, which must be the same as the sender's port;
- Session ID : Can be configured arbitrarily, supporting combinations of Chinese, English, and numbers.
- Security options : No security and Token security modes ;
- Session token : Can be configured arbitrarily, supporting combinations of Chinese, English, and numbers;
- Complete address : The stream address is automatically generated based on the FMG-400 address and configuration parameters;
- Buffering: To balance real-time decoding performance with smoothness across various application scenarios and networks, the device offers multiple buffering strategies for users to choose from. Options include zero buffering, 50ms, 120ms, 200ms, 500ms, 1s , 1.2s... with a maximum support of 15s. The setting should be based on actual network conditions; lower latency parameters can be selected for good networks, while higher latency parameters are needed for poor networks.

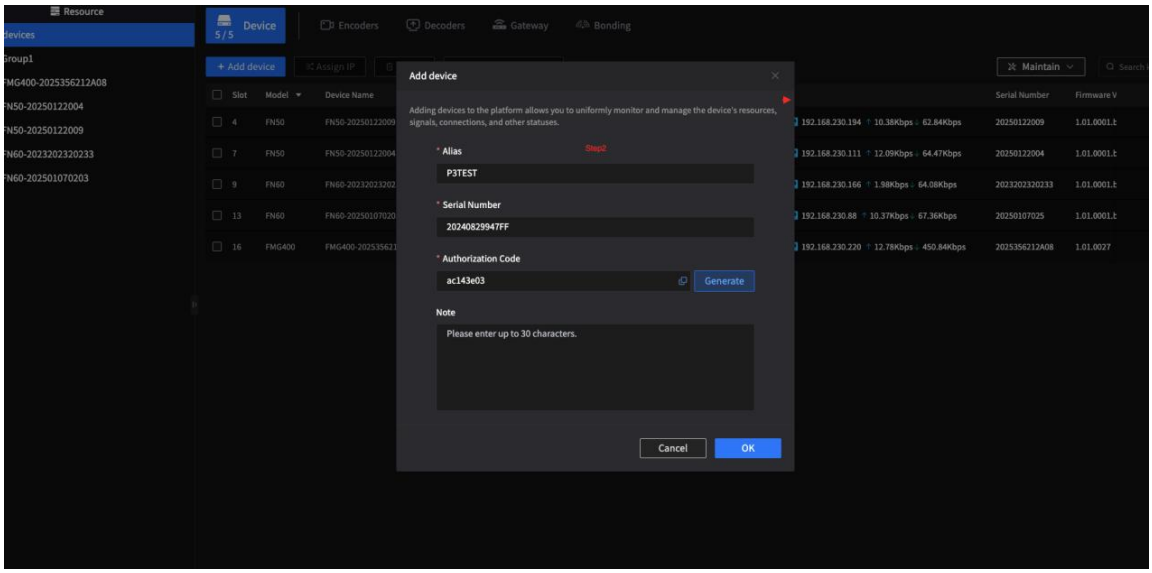
6.1.2 Add Bonding AV Source

6.1.2.1 Add device

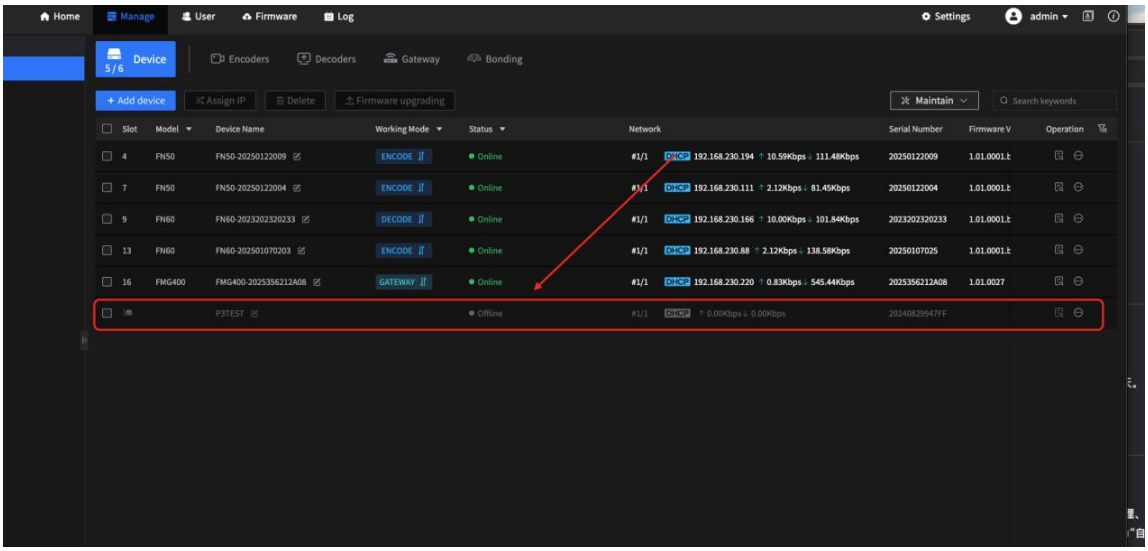
Click RF02 - Management - Devices - + Add Device to add external devices to associate with the RF02 management platform.



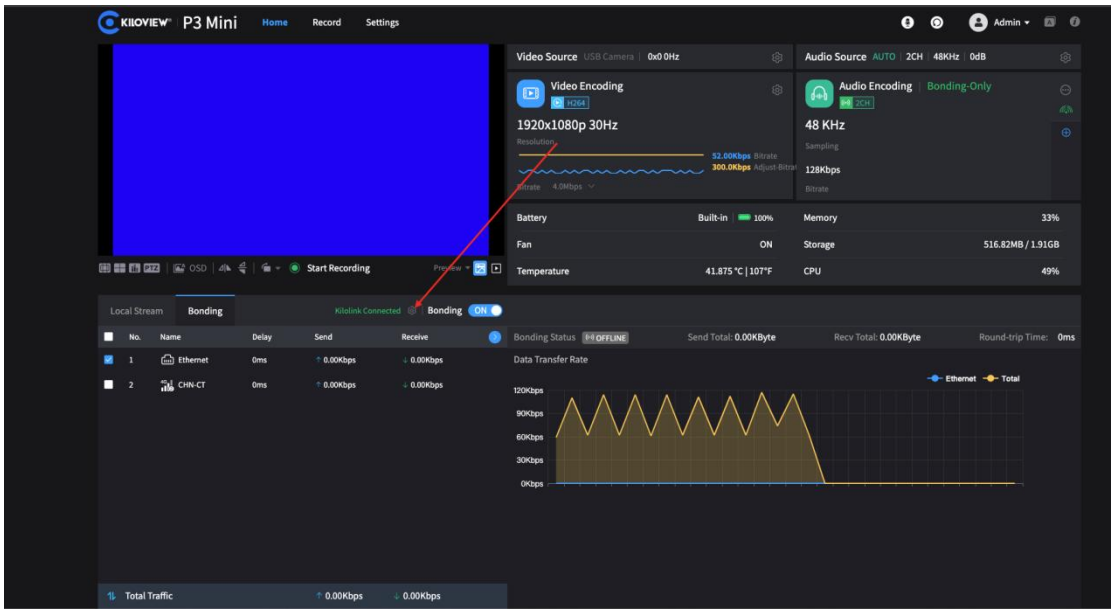
Enter the external device's nickname, serial number, generate RF02 platform authorization code, and remarks (optional), then click Add.



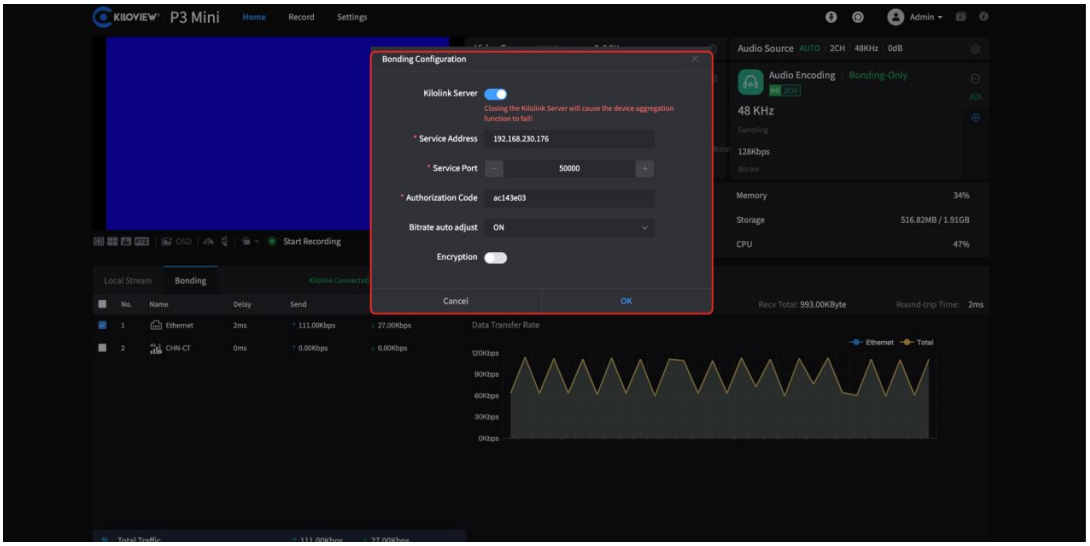
The device has been successfully added, but it is currently showing as offline. Configuration on the device side is now required.



Access the external device's management platform and click the button indicated by the arrow to configure the device. (The Bonding switch needs to be turned on.)

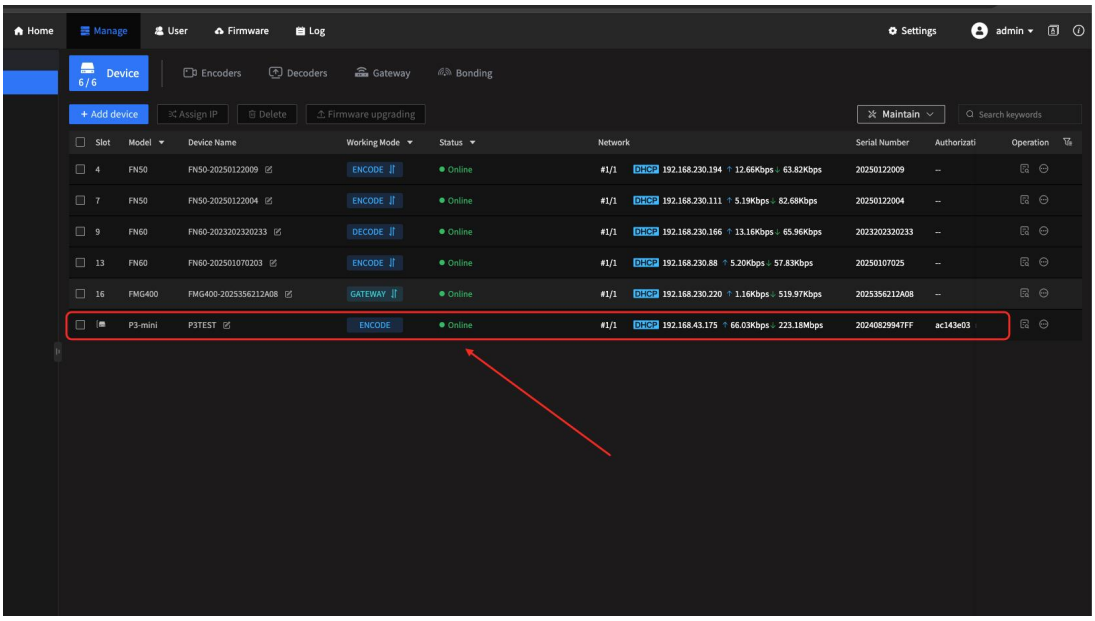


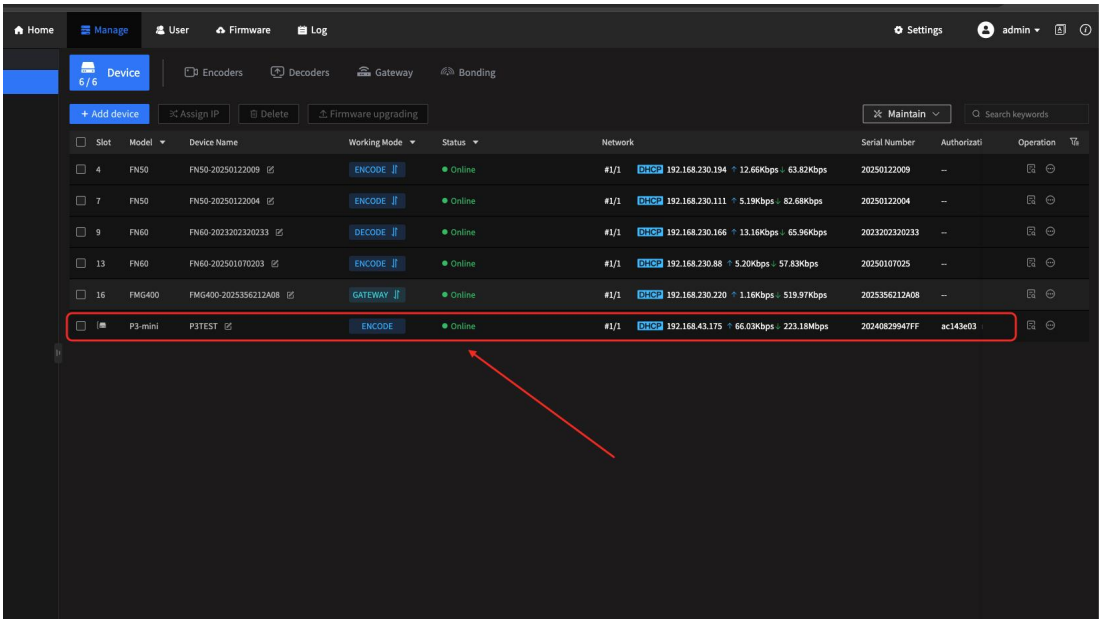
Enter the IP address of RF02 to push basic device information and media data to P3. Also, enter the authorization code generated by RF02 and enter the P3 aggregation streaming configuration . Modify other information according to your own needs. After entering, click confirm.



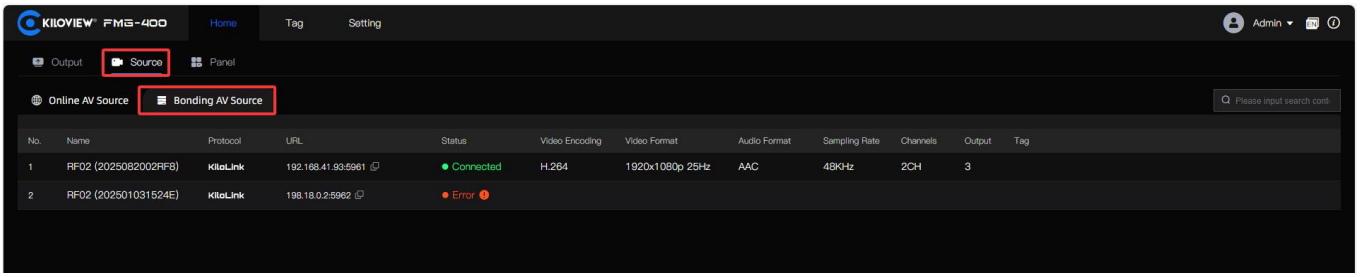
Now, returning to the RF02 management platform, we can see that the P3 is now online, indicating that the addition

was successful.





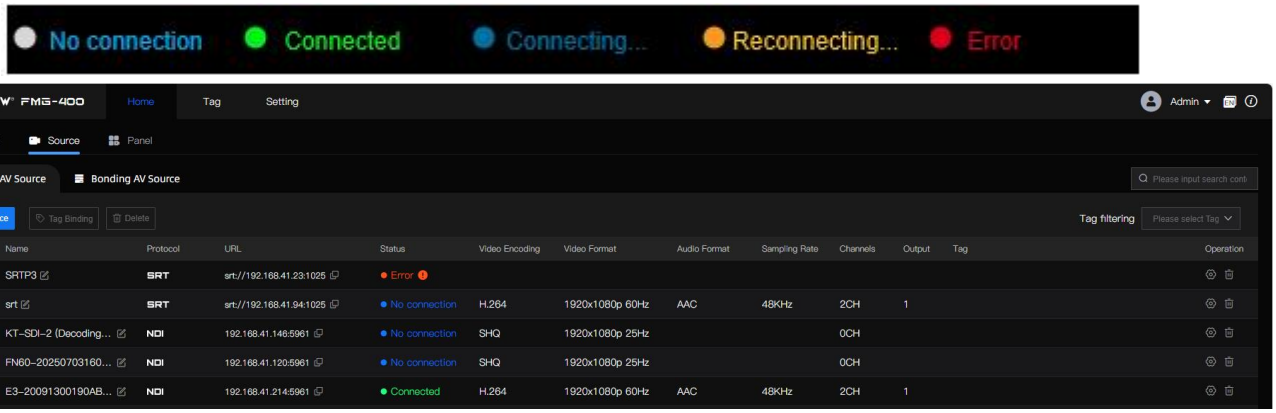
Return to the FMG-400 page - "Home" - " Sources " - " Aggregated Sources". The added P3 streams will be displayed in the aggregated source list.



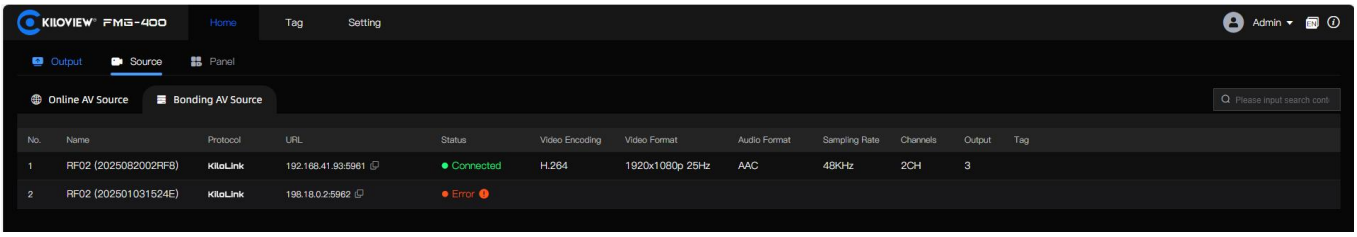
6.1.3 Source State List

The source list is divided into Online AV Source and Bonding AV Source: Bonding AV Source are video streams added via network streams and NDI; Bonding AV Source are video streams generated by aggregating P-series devices added to RF02.

This list displays all the video sources you've added and their parameter information. Not all sources are currently decoding. To decode and output or preview, you need to create an output video stream and bind the source you want to decode in the "Output" interface . A green " Connected " video source is in decoding or streaming mode; a gray " No Connection " source is not being used as a decoding source; a blue " No Connection" source is establishing a connection to prepare for decoding; a yellow "Reconnecting" source indicates a decoding error on the device and an attempt is being made to connect for decoding; and a red "Streaming Error " source may be faulty and does not support decoding.

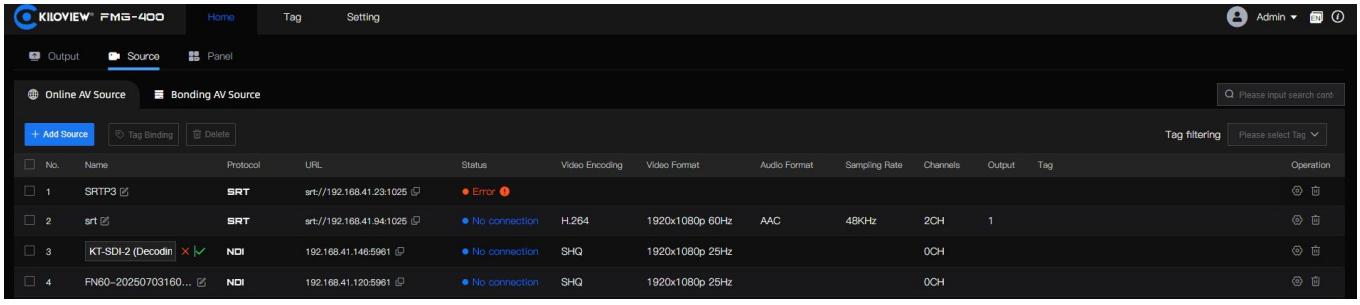


Add to RF02, and the aggregated streaming will automatically display in the aggregated source.

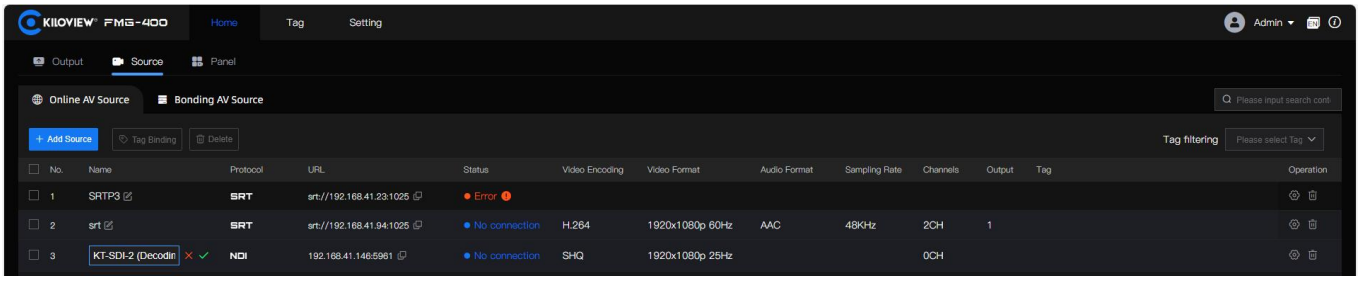


6.1.3.1 Source name modification

In the source list, you can modify the stream name in the open input box for the video stream channel .



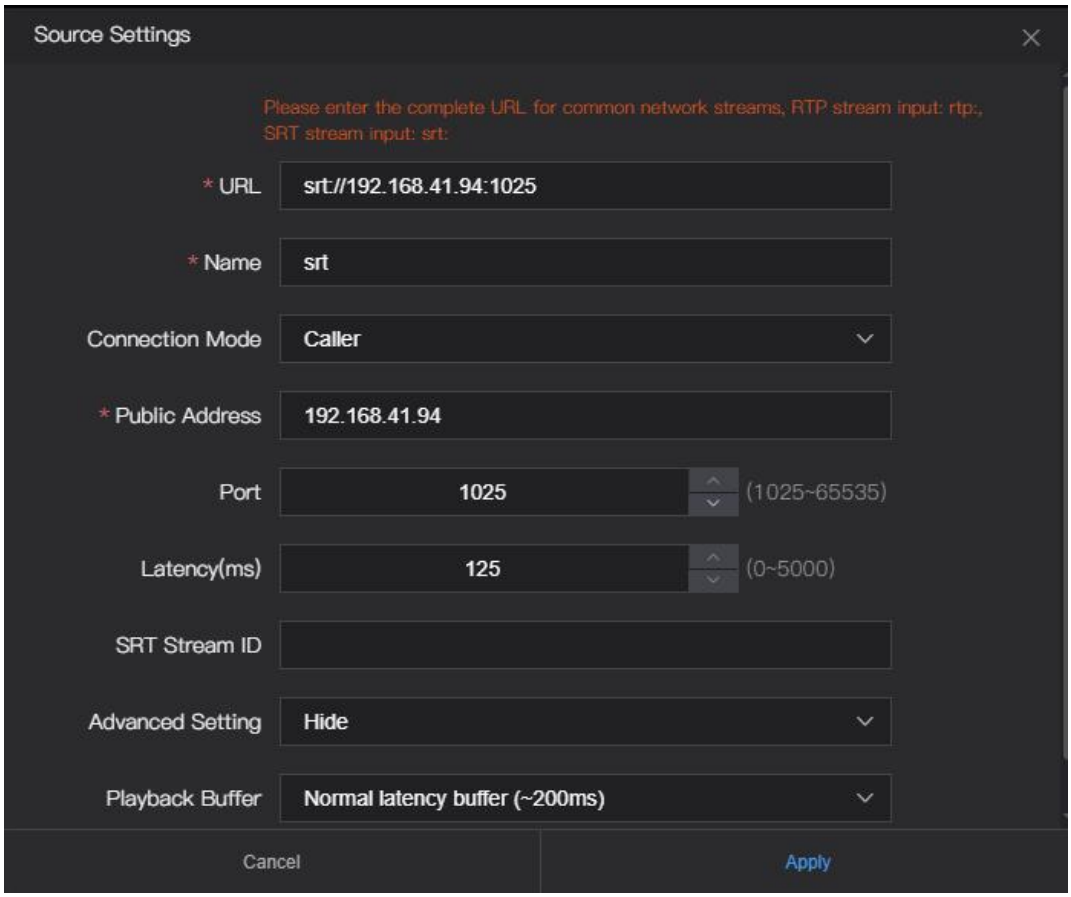
Enter the source name you want to modify in the input box, click Cancel, and then click Apply;



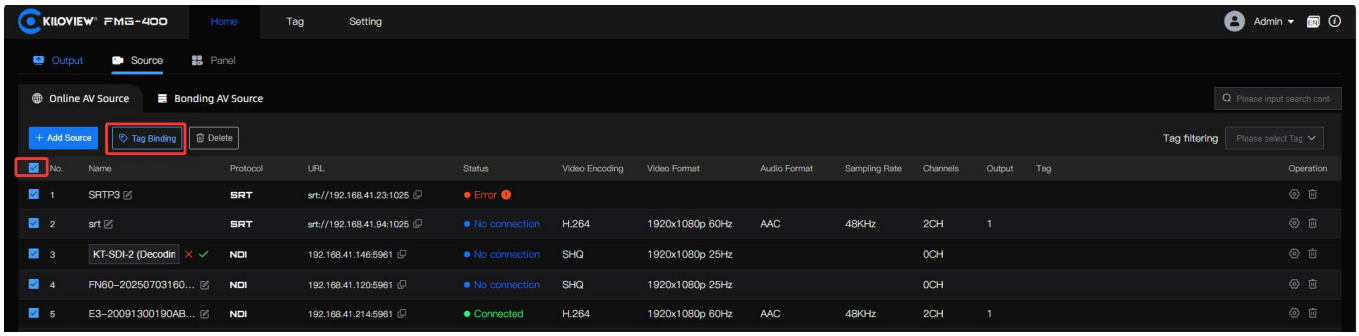
6.1.3.2 Source parameter modification

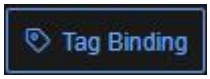
Modify the stream parameters using the source list buttons. (Aggregate stream settings are in the RF02 encoder decoding configuration.)

For protocols that cannot be streamed, you can modify the URL, name, etc. Click "Cancel" to cancel the modification, and click "OK" to confirm the modification.

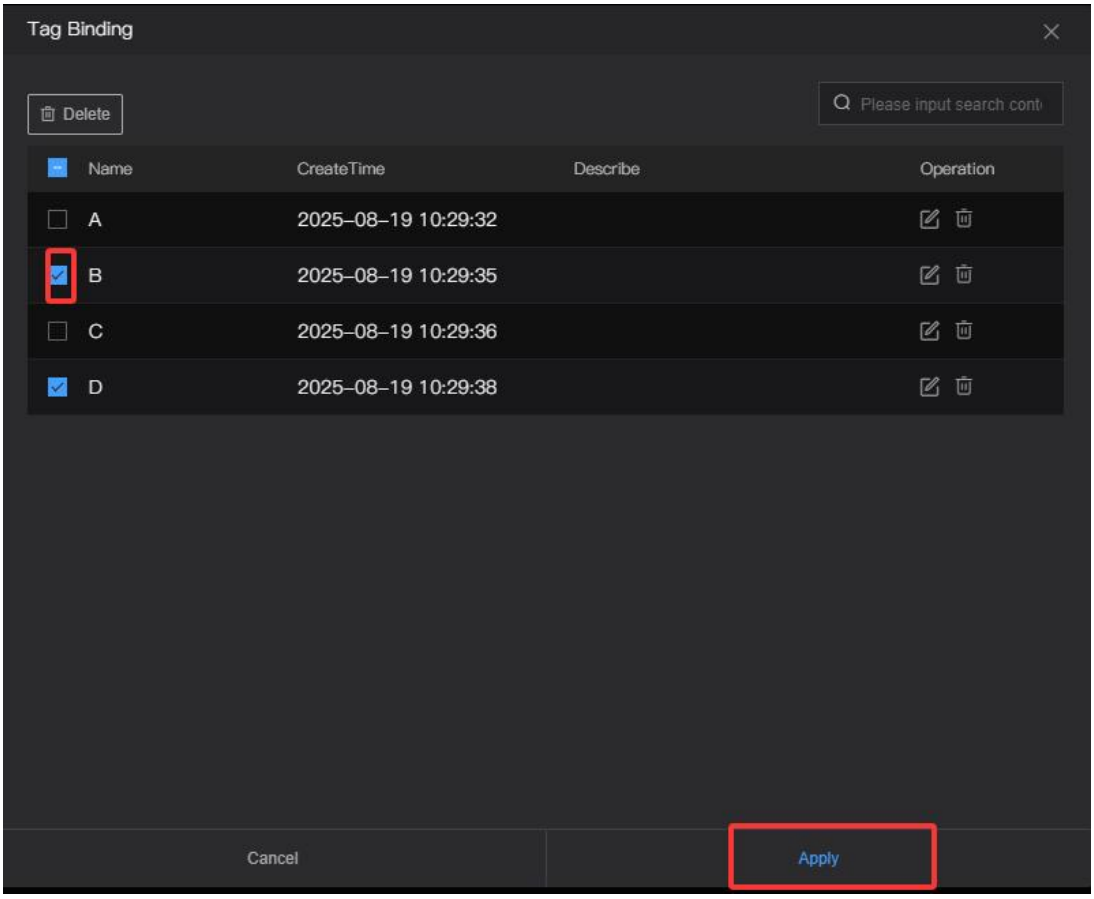


6.1.3.3 Source tag binding and modification

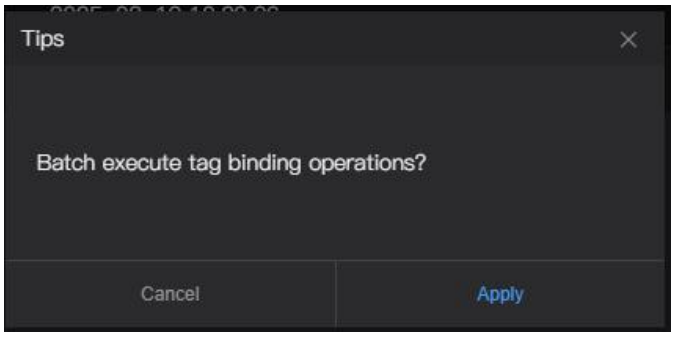


The source tag supports binding tags individually or in batches. By checking the tags that need to be bound and modified, clicking 

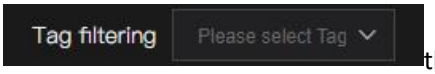
the button will bring up a dialog box. In the bind tag dialog box, you can bind or delete tags by checking the tags and clicking "OK".



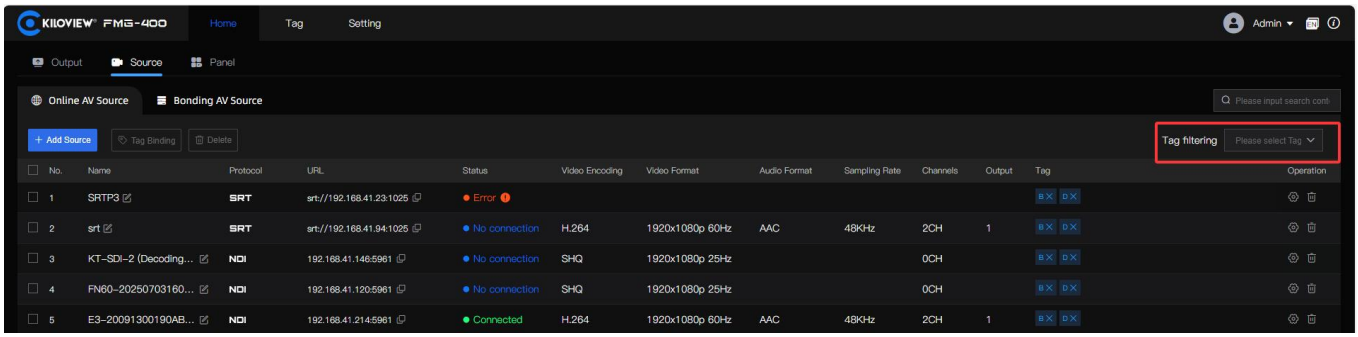
When binding tags to sources in batches, clicking "OK" to bind tags will bring up a prompt box. Clicking "OK" under "Batch execute tag binding operation" will complete the batch tag binding.



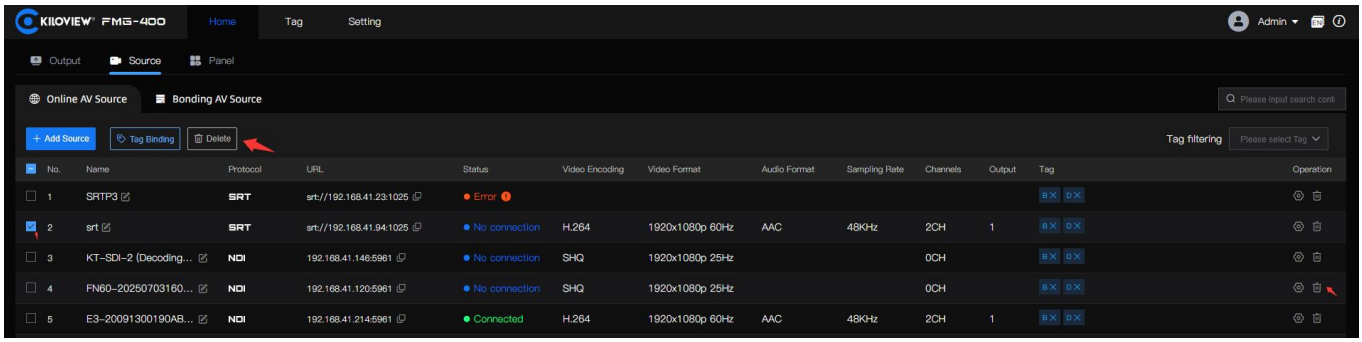
6.1.3.4 Source tag filtering

Click 

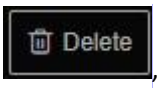
the dropdown menu for tag filtering, select the desired tag name, and you can filter the sources in the source list that have the bound tags into a list. (Bonding AV Source do not support tag filtering.)



6.1.3.5 Source deletion



Method 1: Click the button in the source list , and then click "OK" in the pop-up window to complete the deletion of a single source. Click "Cancel" to cancel the deletion operation.

Method 2: Click the button in the source list 

, and then click "OK" in the pop-up window to complete the deletion of a single source or a batch of sources. Click "Cancel" to cancel the deletion operation.

Note : The aggregated stream is a KiloLink proprietary protocol stream added by RF02 to P-series devices. Deletion and parameter settings are not supported for the aggregated stream decoding.

6.2 Output (Add output)

On the FMG-400 page , clicking the " Add Output " button allows you to configure settings related to adding outputs to the device . There are three main functions: protocol conversion settings , video transcoding settings , and audio transcoding settings .

Protocol conversion settings: Video protocol conversion refers to the conversion between the video transmission protocol or communication protocol of the video source and the output streaming service to enable the transmission and interaction of video data across different network environments, devices, or systems. Its core is to solve the compatibility problem of "transmission rules," rather than directly modifying the video content itself.

Video transcoding settings: Video transcoding refers to modifying parameters such as the container format, encoding method, resolution, and frame rate of a video file to adapt it to different playback devices, editing software, or storage requirements. Unlike protocol conversion, it directly affects the "carrier" and "encoding parameters" of the video content.

Audio transcoding settings: Audio transcoding refers to modifying parameters such as the container format, encoding method, sampling rate, and bit rate of an audio file to adapt to playback devices, optimize sound quality, or meet storage/transmission requirements. The core is to change the "storage format" and "quality parameters" of the audio data.

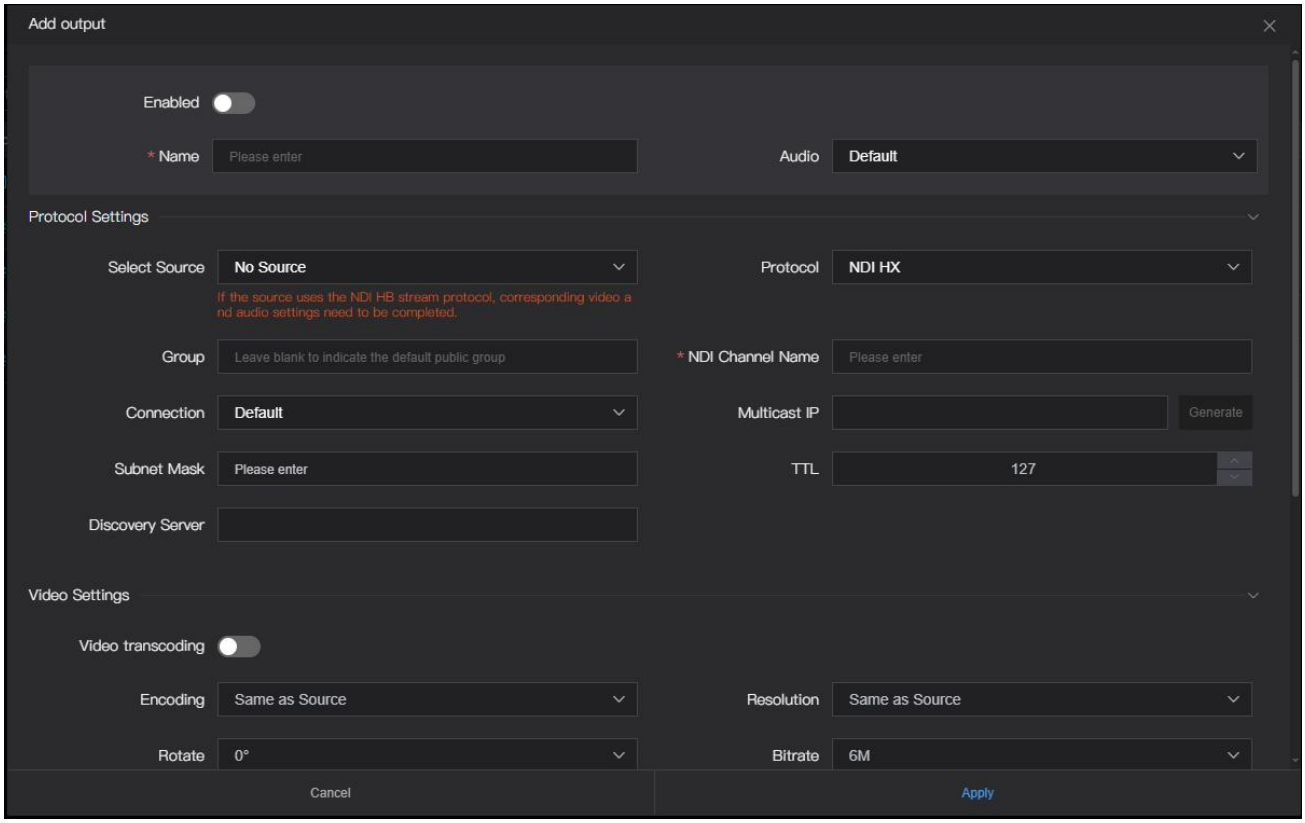
Click on the output list

to bring up the "Add Output" dialog box.

Enable: Allows you to start or stop the streaming service that is about to be created;

Name: You can customize the name of the streaming service you want to create , supporting English, numbers, and symbols;

Audio: Enables or disables audio in the video stream.



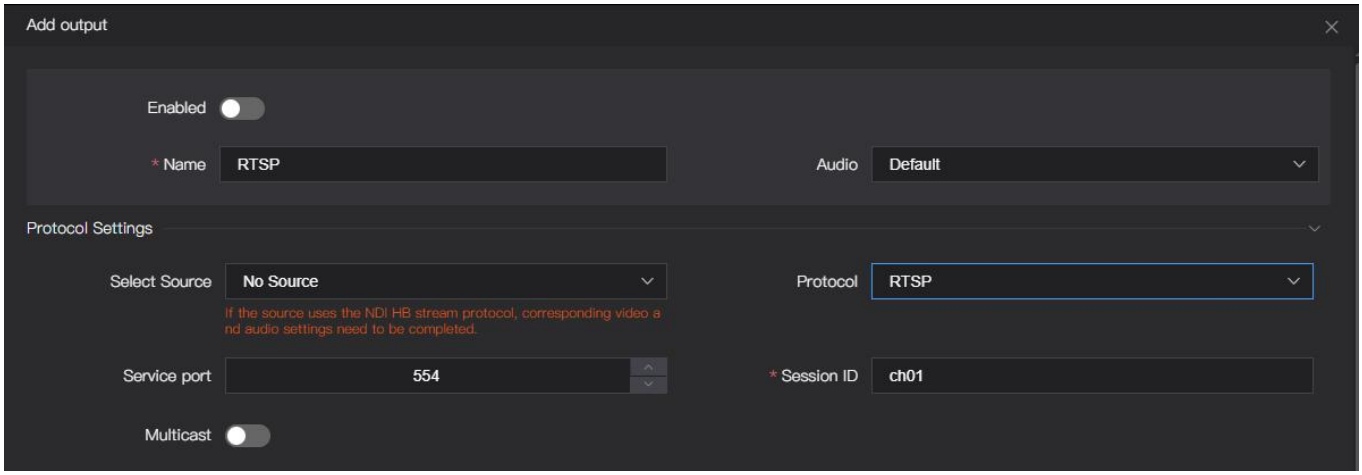
6.2.1 Protocol conversion settings

6.2.1.1 Add RTSP streaming service

RTSP (Real-Time Streaming Protocol) is a text-based application layer protocol released by the IETF in 1998 (RFC 2326, later updated to RFC 7826), specifically for the control and negotiation of real-time audio and video streams.

In the pop-up dialog box , enter the "Name", the service "On/Off" status, and select the source. You can choose the corresponding video source as needed or select "Do not bind source" for now. When you select RTSP stream, the configuration parameters corresponding to the RTSP protocol will automatically pop up. After completing the configuration of the relevant parameters , you need to generate the RTSP stream address based on the device's IP address, service port, and session ID. Click "OK" to add a video output.

For example, if the device's IP address is 192.168.28.195, the service port is set to 554, and the session ID is ch01, then the generated RTSP stream address will be: rtsp://192.168.28.195:554/ch01. Other devices can access and obtain this RTSP stream service through this stream address. Clicking the "Multicast" button will open the configuration of advanced multicast parameters.

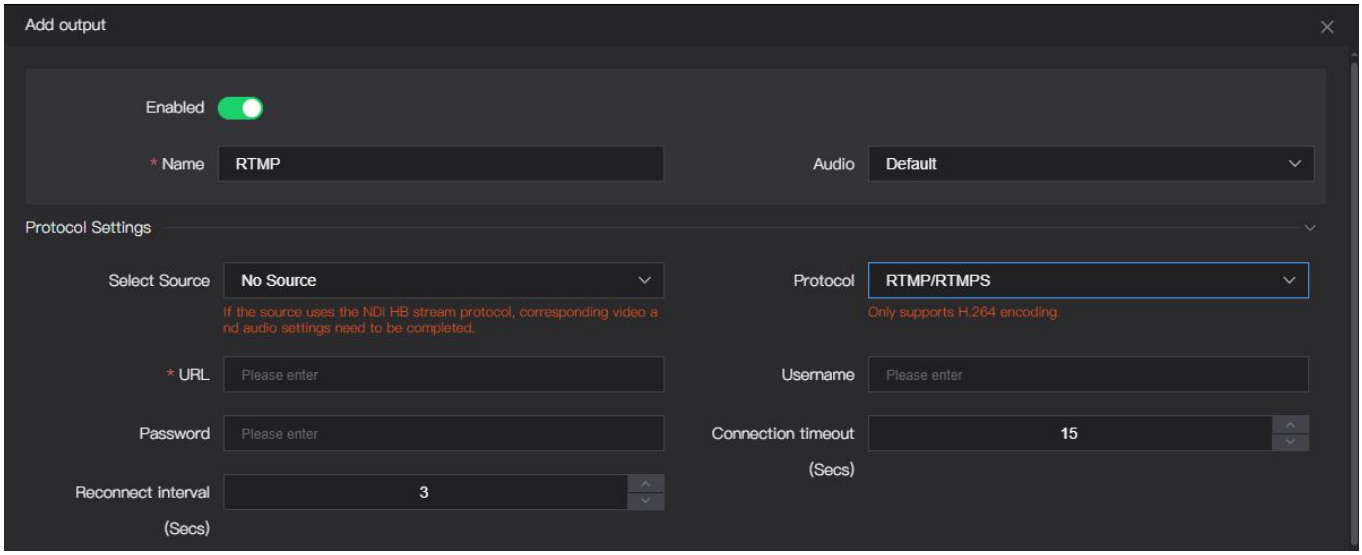


6.2.1.2 Add RTMP/RTMPS streaming service

RTMP (Real-Time Messaging Protocol) is a real-time messaging protocol widely used for audio and video streaming, especially in live streaming scenarios. RTMP enables low-latency audio and video transmission and is a commonly used technology by major live streaming platforms and streaming services.

When using the FMG-400 encoder for RTMP live streaming, a streaming server that supports RTMP services is required to distribute the streaming media. Users need to configure the target streaming platform in advance and fill in its provided RTMP streaming address in the device's "Push Address" field to ensure that the encoder can correctly connect to the streaming platform and complete the streaming operation.

When you select RTMP/RTMPS stream, the corresponding configuration parameters for the protocol will automatically pop up . You need to select the device's RTMP/RTMPS push address, username and password, connection timeout and reconnection interval, and click "OK" to add a video output.



Push Address: Enter the push address provided by the RTMP service platform (e.g., rtmp://server_address/app/stream_key). This address is required; please ensure it is entered correctly to enable push streaming.

Username (optional): Enter the username required by the RTMP server (if required by the platform configuration).

Password (optional): Enter the password required by the RTMP server (if required by the platform configuration).

Connection Timeout (seconds): Sets the timeout for the push streaming connection, in seconds. The default value is 15 seconds. If a connection cannot be established within this time, a reconnection will be attempted.

Reconnection Interval (seconds): Sets the reconnection interval after a streaming failure, in seconds. The default value is 3 seconds.

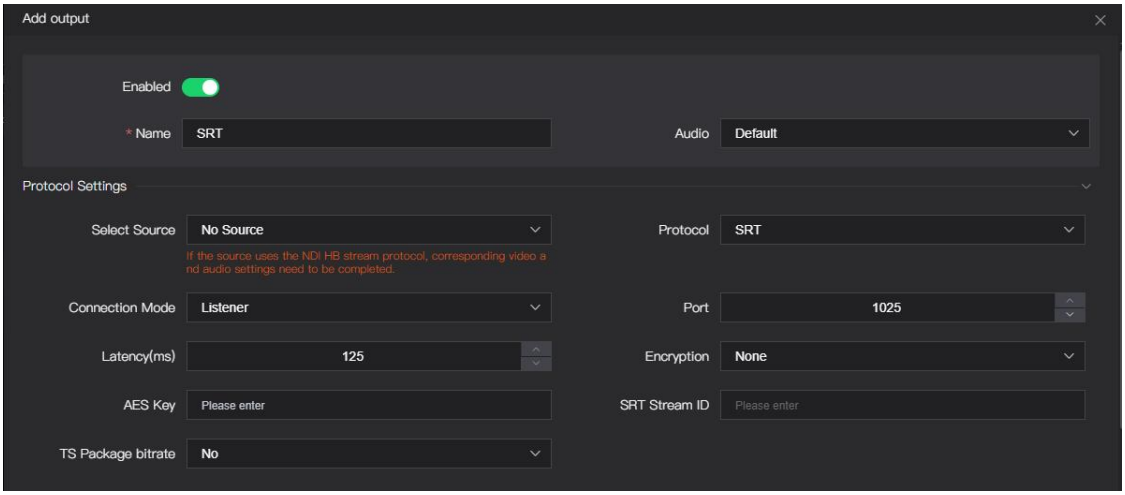
Users need to correctly configure these parameters according to the requirements of the streaming platform to ensure the stability and reliability of the streaming service. After completing all settings, click the "OK" button to save the configuration and start the streaming service.

Note : Some streaming platforms use combined or parameterized RTMP protocol addresses. You must combine them into a complete URL push address according to the platform's rules, otherwise the push may fail.

6.2.1.3 Add SRT streaming service

SRT (Secure Reliable Transport) is a low-latency, high-reliability protocol for streaming media transmission. It features packet loss immunity, jitter buffering, and AES encryption, and is widely used in live streaming, remote production, and video-on-demand scenarios. The steps to add the SRT protocol to an encoder are as follows:

When you select an SRT stream, the configuration parameters corresponding to the SRT protocol will automatically pop up . You need to select the device's SRT handshake mode, address, port number, transmission delay, encryption method, SRT stream ID, and insert empty packets. Click "OK" to add a video SRT output.



- Connection Mode: Supports three modes: Caller, Listener, and Rendezvous.
  - **Caller mode** : The device actively initiates a connection request, similar to a client role.
  - **Listener mode** : The device waits for connection requests from external devices, similar to a server role.
  - **Rendezvous mode** : a peer-to-peer mode where both devices attempt to establish a connection simultaneously, without distinguishing between active and passive.
- **Public IP address** : Sets the IP address of the receiving end, used to establish an SRT connection.
- **Name** : The display name used to identify the push notifications from the streaming service.
- **Port** : Sets the listening port of the receiving end, used to receive SRT data streams.
- **Transmission delay** : The transmission delay is set according to the current network link performance. The delay settings of the SRT source device and the target device will take the larger value as the final transmission delay.
- **Encryption methods** : Supports three AES encryption modes: AES-128, AES-192, and AES-256, to ensure data transmission security.
- **SRT Stream ID** : A unique identifier for an SRT stream, used to distinguish different stream services.
- **AES Key** : Enter a 10-32 character combination of letters or numbers as the encryption key, depending on the encryption method.

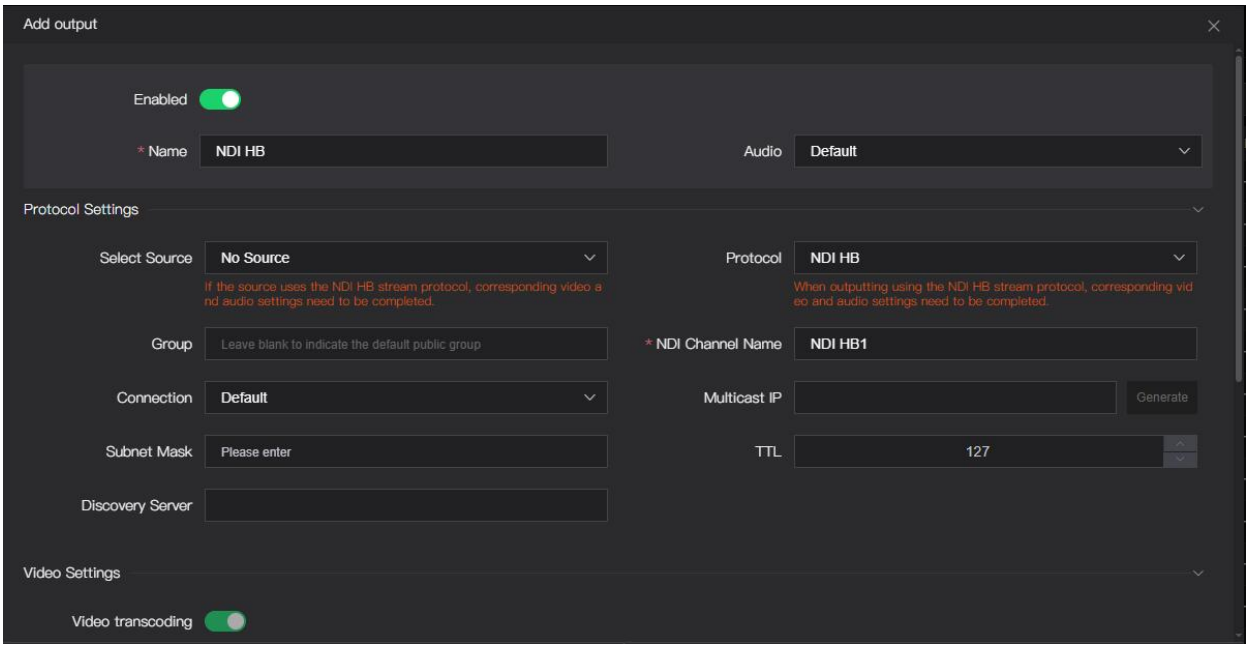
Note : SRT stream ID and AES key are not required fields. If they are required, the decoding end also needs to fill in the corresponding information.

6.2.1.4 Add NDI HB streaming service

NDI HB is a low-latency , high- bandwidth version of the NDI protocol that uses Speed HQ encoding, enabling the transmission of high-quality video streams in high-bandwidth environments.

When you select NDI HB stream, the configuration parameters corresponding to the NDI protocol will automatically

pop up . You need to set the group, channel name, connection method, multicast address, subnet mask, TTL and discovery server as needed. Click "OK" to add an NDI HB video output.



Groups: The group function is used to organize and manage multiple NDI devices or sources, making it convenient for users to classify and manage NDI sources. Group names can consist of English letters and numbers, and multiple group names can be configured, separated by English commas. The encoder's NDI HB stream is set to a public group by default. If you do not want other devices to be able to find this NDI source, you can set a specific group name. After setting it, only devices that have joined the same group name can find the NDI source, thereby improving device security and manageability.

Channel Name: Each device or source transmitting via the NDI protocol will have a unique channel name; when there are multiple NDI sources on the same network, please set different channel names;

Connection: There are two connection methods: unicast and multicast. Unicast is used by default for transmission. Unicast is a one-to-one communication mode between devices, while multicast is a communication mode between devices and a group. That is, devices that have joined the same group can receive all the data sent by the device.

Discovery server: Register the discovery of the source with the discovery server. Refer to the Discovery Server section for operation steps.

After configuration, we can discover and output the NDI source through the NDI access software, and distinguish different NDI sources by device name and channel name.

The NDI discovery server allows a large number of NDI devices and applications to automatically find each other within the same network, simplifying device and source management and operation. NDI sources are centrally registered with the server, and receivers obtain NDI sources from the server. This function can also be configured to send output video streams to NDI receivers across different network segments.

Log in to the NDI official website (https://ndi.tv/sdk/) on the computer that will act as the server to download and install the NDISDK. After installation, run Bin\Utilities\x64\NDIDiscoveryService.exe in the installation directory.

The NDI encoder configures the receiving IP address in the discovery server, and NDI will register with the server. It is recommended to configure the receiving IP address as a static IP address to prevent NDI connection loss due to IP reassignment.

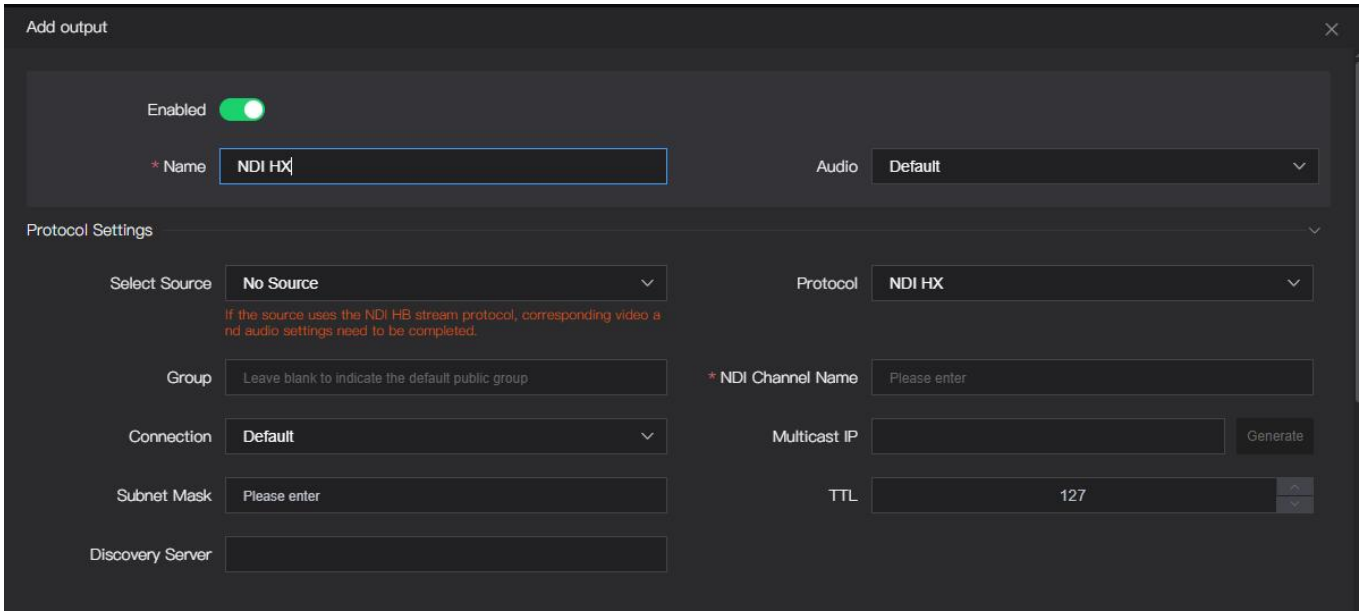
On the decoder's configuration page, click "Discover Server" to enable the feature, and set the discovery server address to the IP address of the computer that enabled the discovery server feature. After saving the configuration, the

receiving end can discover NDI streams that have been registered with the server.

> **Note:** Enabling this feature disables mDNS auto-discovery. The encoder's output video stream can only be sent to the specified server, and the receiving end must register with the same discovery server to retrieve the NDI stream.

6.2.1.5 Add NDI HX streaming service

NDI HX is a more efficient, low-bandwidth version of the NDI protocol that uses compression technologies (such as H.264/H.265) to enable the transmission of high-quality video streams even in bandwidth-constrained environments. When you select an NDIHX stream, the configuration parameters corresponding to the NDI protocol will automatically pop up . You need to set the group, channel name, connection method, multicast address, subnet mask, TTL and discovery server as needed. Click "OK" to add an NDIHX video output.



Groups: The group function is used to organize and manage multiple NDI devices or sources, making it convenient for users to classify and manage NDI sources. Group names can consist of English letters and numbers, and multiple group names can be configured, separated by English commas. The encoder's NDIHX stream is set to a public group by default. If you do not want other devices to be able to find this NDI source, you can set a specific group name. After setting it, only devices that have joined the same group name can find the NDI source, thereby improving device security and manageability.

Channel Name: Each device or source transmitting via the NDI protocol will have a unique channel name; when there are multiple NDI sources on the same network, please set different channel names;

Connection: There are two connection methods: unicast and multicast. Unicast is used by default for transmission. Unicast is a one-to-one communication mode between devices, while multicast is a communication mode between devices and a group. This means that devices that have joined the same group can receive all data sent by the device.

Discovery server: Register the discovery of the source with the discovery server. Refer to the Discovery Server section for operation steps.

After configuration, we can discover and output the NDI source through the NDI access software, and distinguish different NDI sources by device name and channel name.

The NDI discovery server allows a large number of NDI devices and applications to automatically find each other within the same network, simplifying device and source management and operation. NDI sources are centrally registered with the server, and receivers obtain NDI sources from the server. This function can also be configured to send output video streams to NDI receivers across different network segments.

Log in to the NDI official website (https://ndi.tv/sdk/) on the computer that will act as the server to download and install the NDISDK. After installation, run Bin\Utilities\x64\NDIDiscoveryService.exe in the installation directory.

The NDI encoder configures the receiving IP address in the discovery server, and NDI will register with the server. It is recommended to configure the receiving IP address as a static IP address to prevent NDI connection loss due to IP reassignment.

On the decoder's configuration page, click "Discover Server" to enable the feature, and set the discovery server address to the IP address of the computer that enabled the discovery server feature. After saving the configuration, the receiving end can discover NDI streams that have been registered with the server.

Note: Enabling this feature disables mDNS auto-discovery. The encoder's output video stream can only be sent to the specified server, and the receiving end must register with the same discovery server to retrieve the NDI stream.

6.2.1.6 Add HLS streaming service

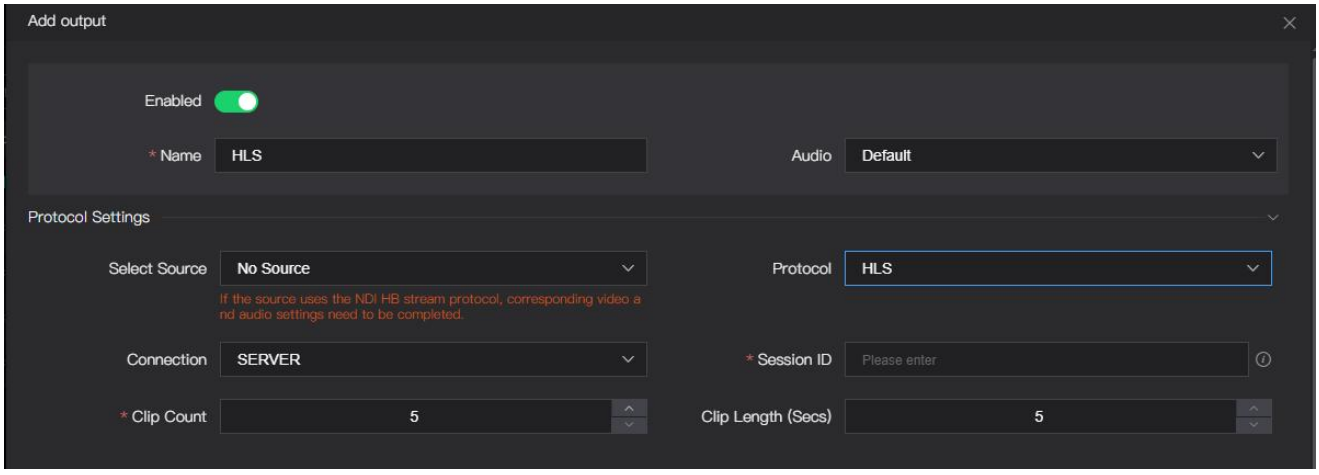
HLS (HTTP Live Streaming) is a streaming media transmission technology based on the HTTP protocol, widely used in live video streaming and video-on-demand scenarios. HLS achieves good compatibility and playback experience by slicing audio and video content into small files and transmitting them in segments via HTTP, making it particularly suitable for cross-platform and complex network environments.

Service outputting HLS supports two modes:

Push mode: The device actively pushes data to the specified media server. In this mode, the target MediaPlaylist address must be filled in to complete the push streaming configuration.

Server mode: The device actively requests data as a client. In this mode, a session ID must be entered to establish a connection.

Users can select the appropriate HLS mode according to their actual needs and fill in the corresponding parameters correctly to ensure the normal operation of the streaming service.



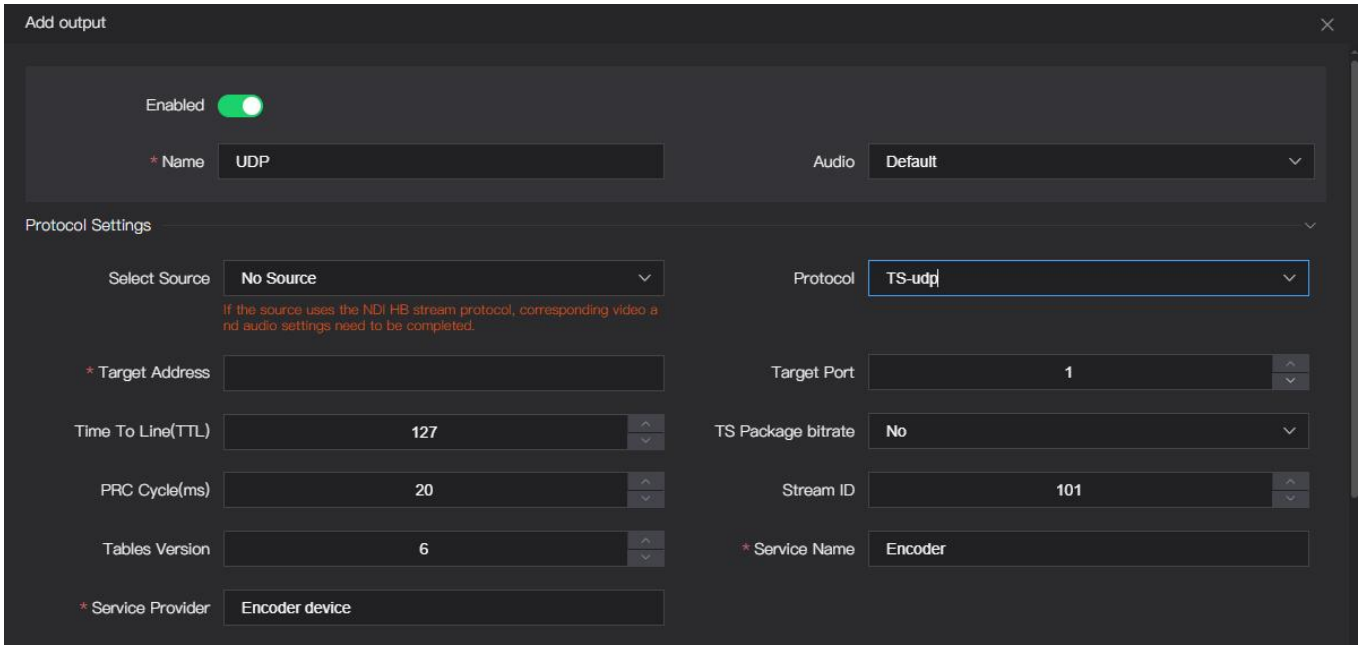
When you select an HLS stream, the configuration parameters for the HLS protocol will automatically pop up . You need

to set the connection mode, SERVER/PUSH, session ID/ Mediaplaylist , number of segments, and segment length (seconds) as needed. Click "OK" to add an HLS video output. (Note: For some streaming platforms, such as YouTube, you need to add the stream.m3u8 suffix.)

6.2.1.7 Add TS-UDP streaming service

TS-UDP is a streaming media transmission method based on the UDP protocol, used for real-time transmission of TS (TransportStream) format audio and video data. It features high efficiency and low latency and is widely used in multi-device audio and video transmission scenarios within a local area network.

When you select TS-UDP stream, the configuration parameters for the TS-UDP protocol will automatically pop up. You need to set the push address, target port, multicast TTL and discovery server as needed. Click "OK" to add a TS-UDP video output.



TS-UDP push mode supports both unicast and multicast modes:

When pushing via unicast, the "Push Target Address" field must be the IP address of the device receiving the TS stream, the "Target Port" field must be set to a port not occupied by other services, and the "Multicast TTL" field can remain at its default setting. Unicast pushing only allows decoding and playback of the TS stream at the specified target address.

In multicast mode, the "Push Target Address" field must be filled with a correct multicast address (range: 224.xxx~239.xxx). For other parameters, unless there are special requirements, it is recommended to use the default configuration. Users can choose the appropriate push mode according to their actual application scenarios.

After setup, a URL will be generated in the TS-UDP push bar. This URL can be used to decode and play the content using decoding devices such as VLC. If multicast is being decoded and played on a computer, the computer's firewall needs to be disabled, and the network gateway needs to be configured.

Notice:

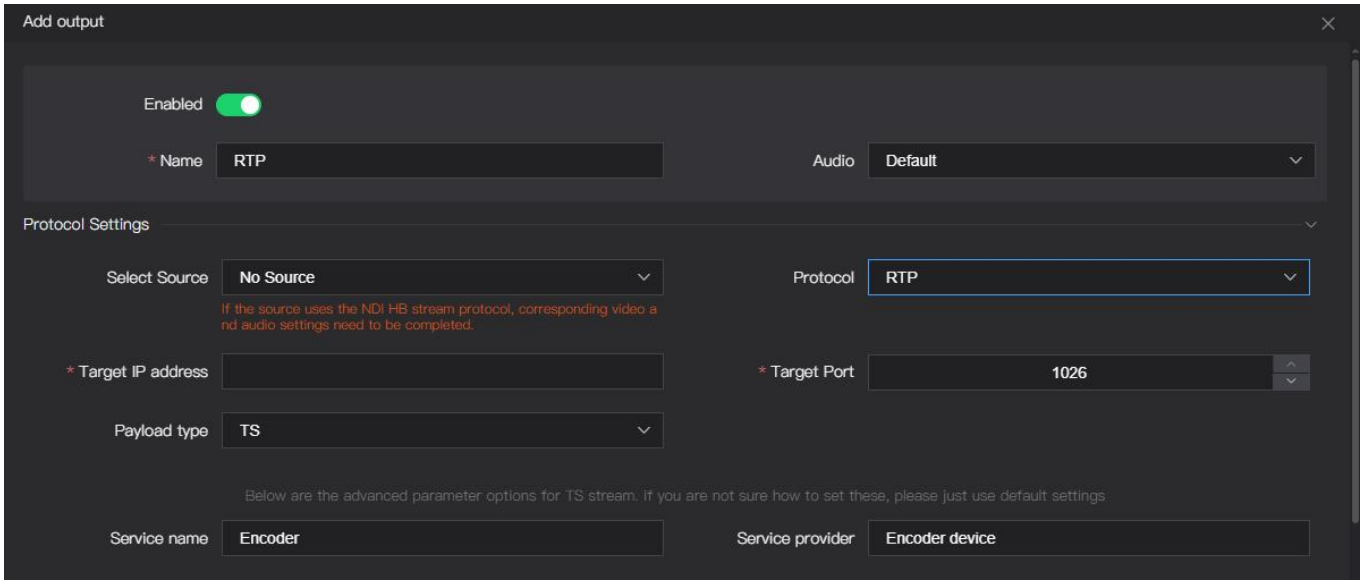
1. Multicast network requirements: Multicast pushes can only be decoded and played within the same subnet (network segment), and both the encoder and playback device need to have the network gateway correctly configured.
2. Special Note for VLC Player: When using VLCMediaPlayer to play multicast streams emitted by

this device, an "@" symbol must be added before the playback URL. For example, if the push address is udp://225.6.6.6:1234, then in VLC you should enter udp://@225.6.6.6:1234.

6.2.1.8 Add RTP streaming service

RTP (Real-time Transport Protocol) is a protocol designed specifically for real-time audio and video data transmission, commonly used in Transport Stream (TS) transmission scenarios. RTP features low latency and high efficiency, making it suitable for live streaming and real-time audio and video transmission needs.

When you select an RTP stream , the configuration parameters for the RTP protocol will automatically pop up. You need to set the target IP address, target port, and payload type as needed, and then click "OK" to add an RTP video output.



Parameter Configuration Instructions: Based on the configuration interface, the following are detailed explanations of each parameter:

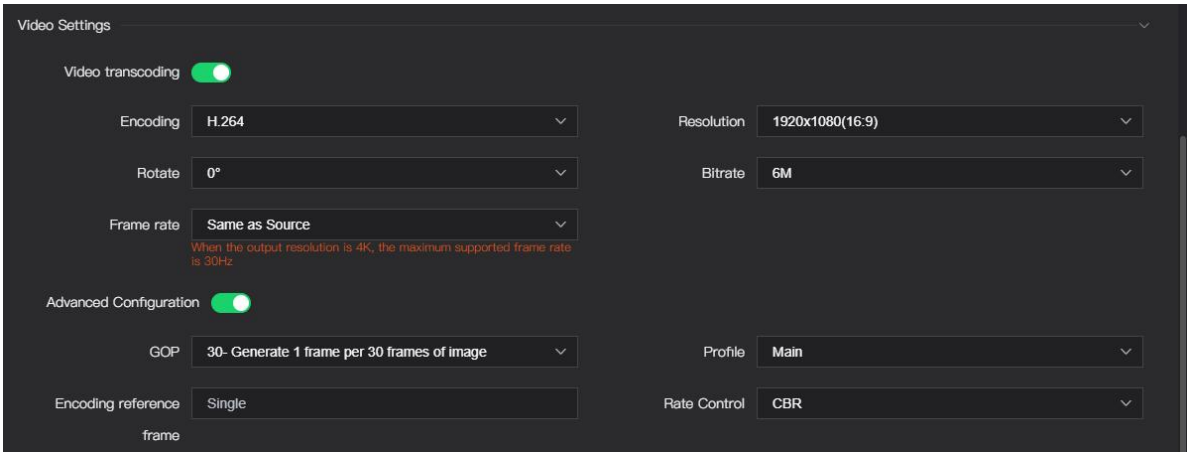
- **Note** : The RTP protocol does not support G.711 audio encoding; AAC encoding must be used.
- **Target IP address** : Sets the IP address of the receiving device to specify the target of the RTP stream.
- **Target port** : Sets the listening port of the receiving device. The default value is 1026. Ensure that the port does not conflict with other services.
- **Transport type** : The default selection is TS (TransportStream), which is suitable for the transmission of video and audio.
- **Advanced options** include the service name (ServiceName) and the service provider (ServiceProvider), which can be customized or the default values can be retained as needed.

6.2.2 Video conversion settings

6.2.2.1 Video transcoding

In the pop-up window, you can enable video transcoding and configure settings such as encoding method, output resolution, frame rate, bit rate, and flipping.

It also supports advanced parameter configurations such as GOP size, Profile, encoding reference frame, and bitrate control method.



- Supported encoding methods for output: H264/265/SHQ (NDI HB), or the original value can be the format of the output binding source;
- Supported output resolutions: Original, 3840x2160 (4K), 1920x1080 (16:9), 1280x720 (16:9), 1024x576 (16:9), 800x600 (4:3), 960x540 (16:9), 720x576 (PAL), 720x480 (NTSC);
- Supported output frame rates: raw, 60Hz, 50Hz, 30Hz, 25Hz;
- Supported output bitrates: 128K, 256K, 512K, 768K, 1M, 1.2M, 1.5M, 2M, 2.5M, 3M, 4M, 6M

8M, 10M, 12M, 15M, 20M, 25M;

- Video output supports video rotation: 0°, 90°, 180°, 270°.

When outputting non-NDI HB protocol, video transcoding also supports advanced configurations such as adjusting GOP size, Profile, encoding reference frame, and bitrate control method.

- GOP size: 1 - all frames are 1 frame, 30 - 1 frame is generated every 30 frames, 60 - 1 frame is generated every 60 frames.

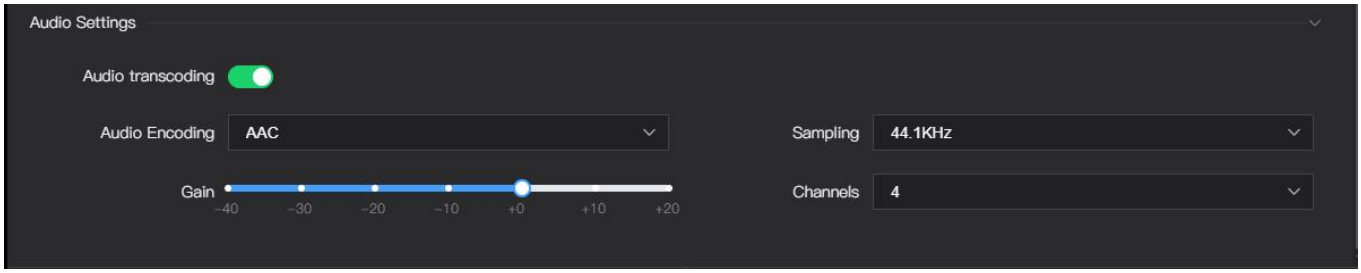
90 - 1 frame is generated every 90 frames, 120 - 1 frame is generated every 120 frames, 150 - 1 frame is generated every 150 frames.

180 - One frame is generated for every 180 frames.

- Profile: Baseline, Main, High
- Encoded reference frames: single reference frame, multiple reference frames
- Bitrate control methods: CBR, VBR

6.2.3 Audio transcoding settings

After enabling video transcoding, you can configure the encoding, sampling rate, number of channels, and gain.



- Supported encoding methods for output: AAC, G.711, PCM;
- Supported sampling rates for output: raw, 8kHz, 16kHz, 44.1kHz, 48kHz;
- Output supported number of channels: original value, 2, 4, 6, 8;

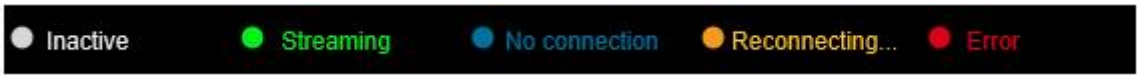
  Gain: Supports adjustment from -40 to +20

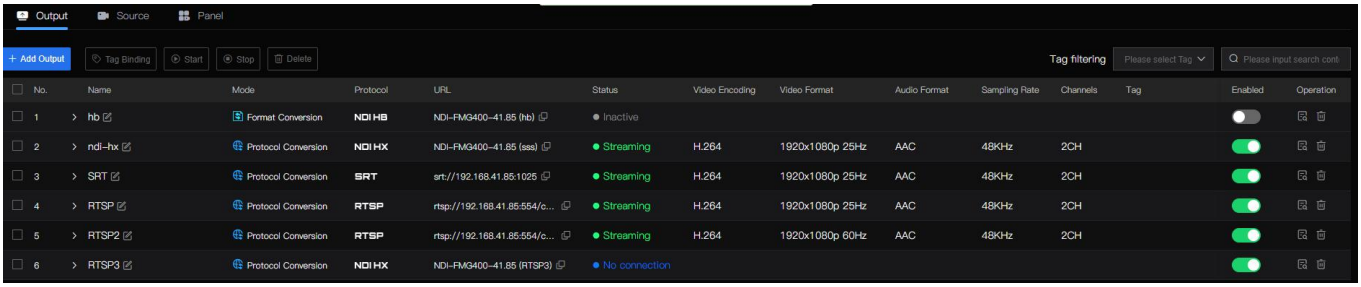
Note

- NDI HB only supports PCM encoding, NDI HX and RTMP/RTMPS only support AAC encoding .

6.2.4 Output status list

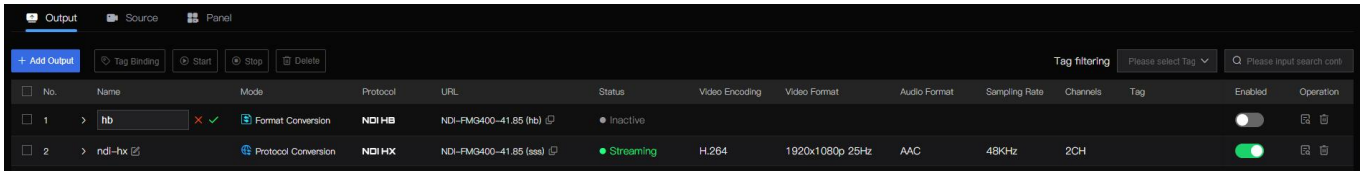
The output and source parameter information you have added . Not all sources are in decoding mode. To decode the output or preview, you need to create an output video stream and bind the source to be decoded in the "Output" interface . A video source displayed in green " Connected " is in decoding or streaming mode; a video source displayed in blue " No Connection " is not being used as a decoding source; a video source displayed in gray " Not Started " indicates that the source has established a connection with the output and the output is ready for encoding ; a video source displayed in yellow "Reconnecting" indicates that the source is experiencing decoding problems on the device and is attempting to connect for decoding; a video source displayed in red "Streaming Error " indicates that the source may be faulty and does not support decoding, etc.



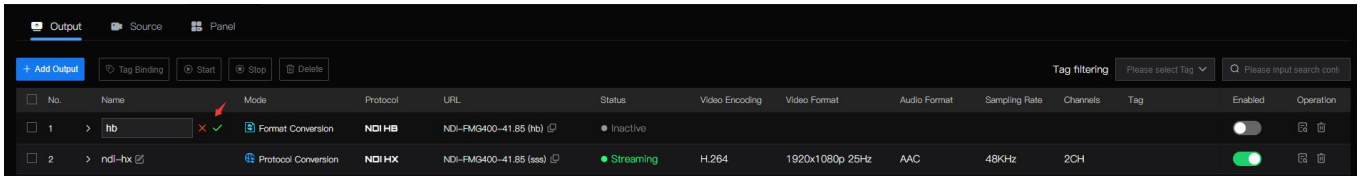


6.2.4.1 Output name modification

In the output list, you can open the input box for the video stream channel and modify the stream name.



Enter the ouput name you want to modify in the input box, click Cancel, and then click Apply;

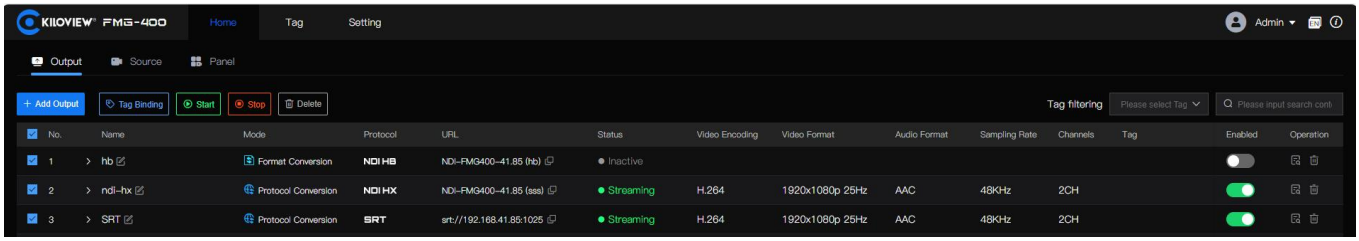


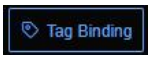
6.2.4.2 Output name modification

Modify the stream parameter information by using the output list button.

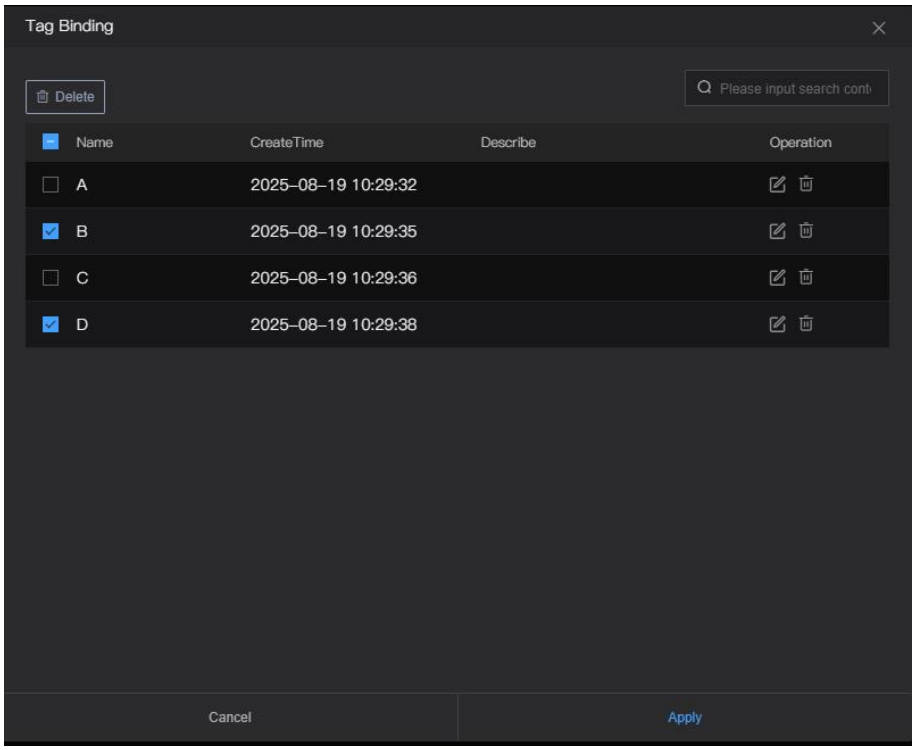
For protocols that cannot be streamed, you can modify parameters such as URL and name. Click "Cancel" to cancel the modification, and click "OK" to confirm the modification.

6.2.4.3 Output tag binding and modification

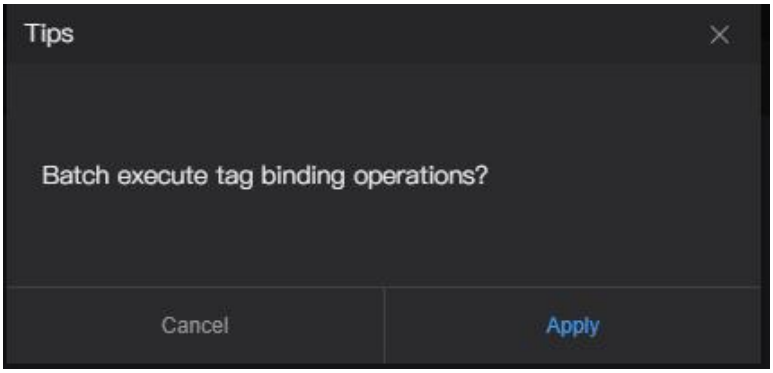


The output tags support binding tags individually or in batches. By checking the tags that need to be bound or modified, clicking 

the button will bring up a dialog box. In the "Bind Tags" dialog box, you can bind or delete tags by checking the tags and clicking "OK".



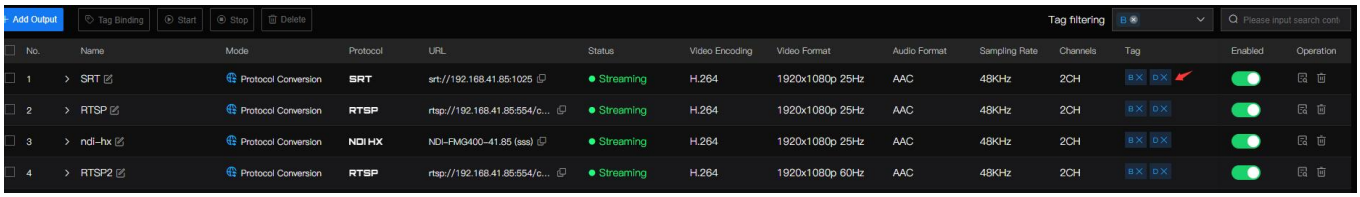
When binding output tags in batches, clicking "OK" to bind tags will bring up a prompt box. Clicking "OK" under "Batch execute tag binding operation" will complete the batch tag binding.



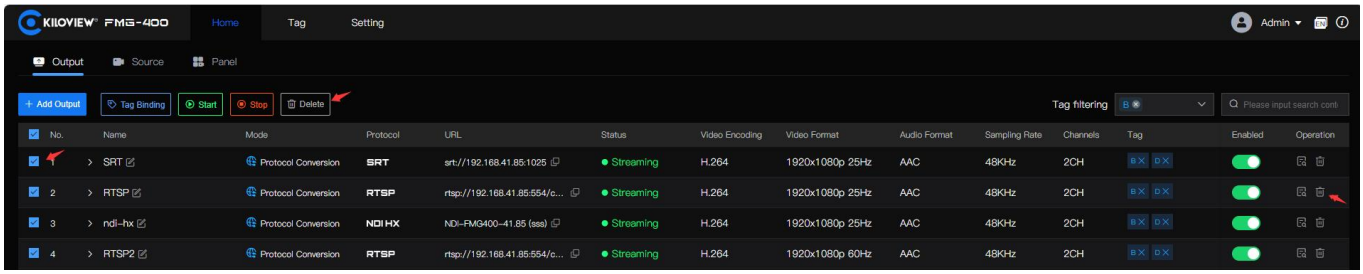
6.2.4.4 Output tag filtering

Click

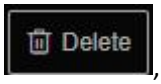
the drop-down window for tag filtering, select the specified tag name, and you can filter the output in the output list that have been bound to the tag into a list.



6.2.4.5 Output deletion



Method 1: Click the button in the output list , and then click "OK" in the pop-up window to complete the deletion of a single output. Click "Cancel" to cancel the deletion operation.

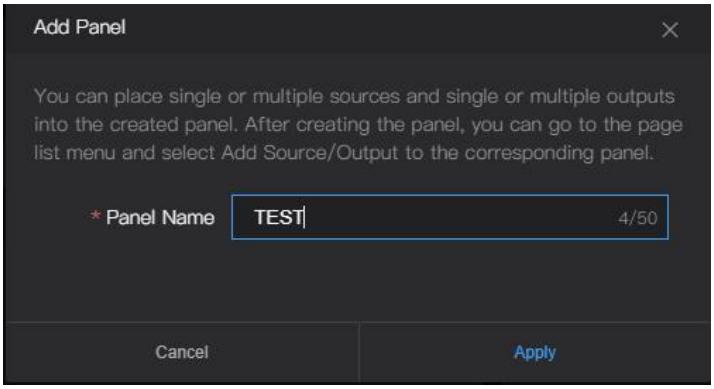
Method 2: Click the button in the output list 

, and then click "OK" in the pop-up window to complete the deletion of a single output or a batch of outputs. Click "Cancel" to cancel the deletion operation.

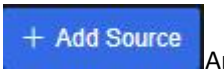
7 Panel Configuration

7.1.1 Add Panel

In the navigation bar, click "Panels" to access the panel settings. button in the panel list, enter the panel name in the pop-up window, and click "OK" to create a panel.

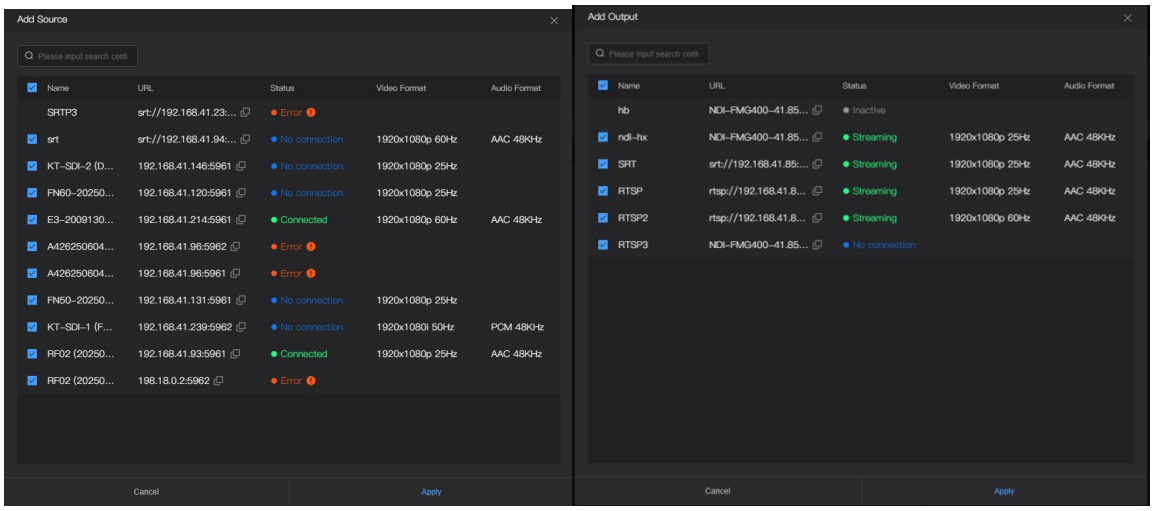


7.1.2 Adding Sources and Outputs

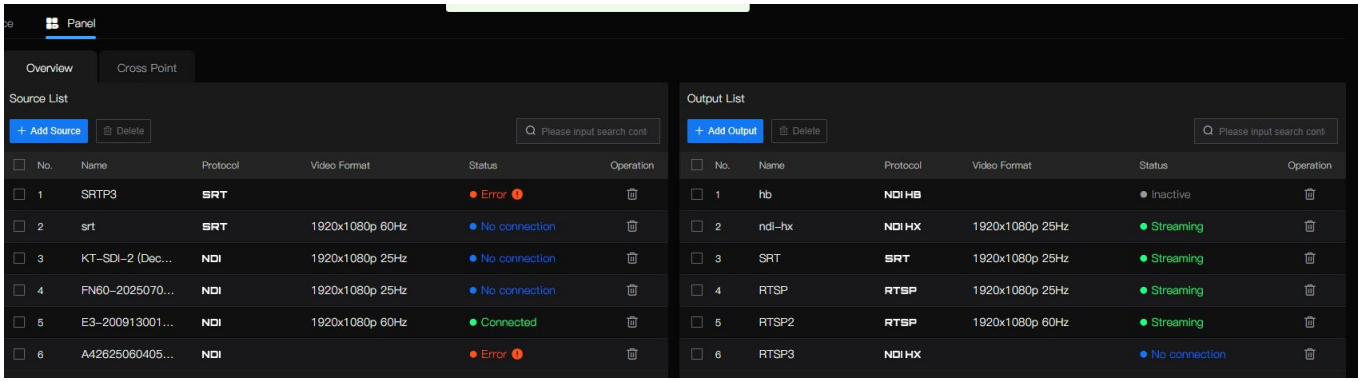
On the overview screen, click "Add Source". 

And "Add output"

select the required items from the list.

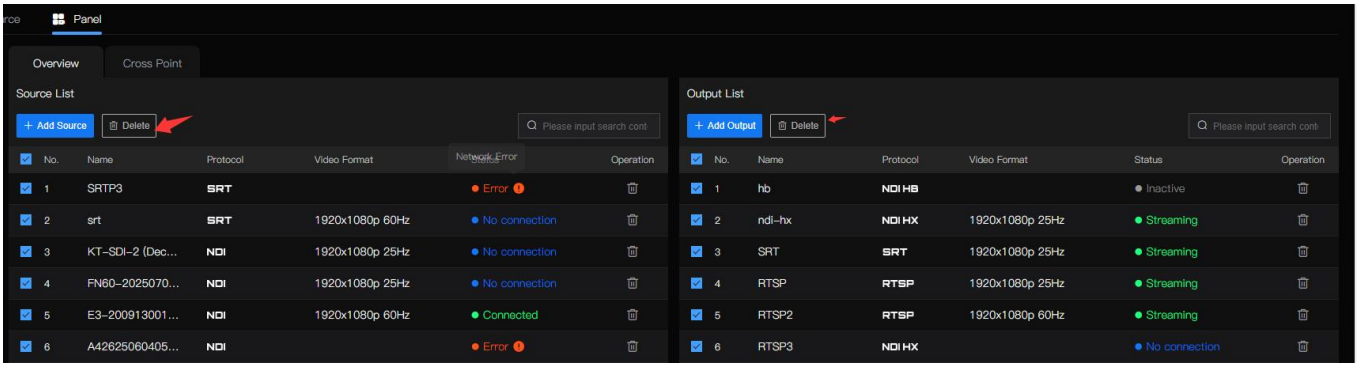


Click "OK" to add the corresponding video streams from the source list and output list to the panel overview interface.



7.1.3 Delete the "Source" or "Output"

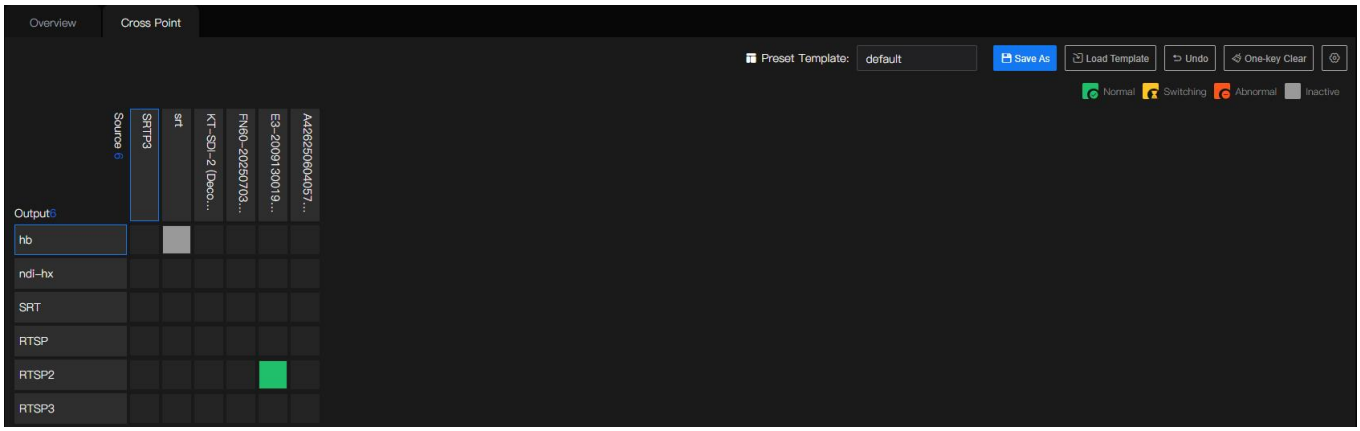
Check the source list and output list in the panel, then click "Delete" or the deletion operation can then be completed.



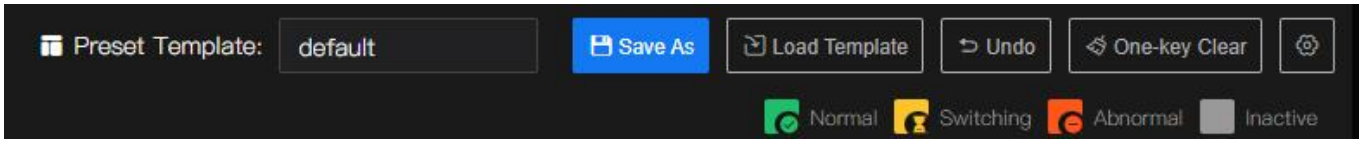
7.1.4 Cross Point Management

Cross Point Status：

Normal: The "output" has started successfully, and the "source" connection is normal;
Switching: The "output" has started successfully, switching from "source" A to "source" B, and "source" B is connecting;
Abnormal: The "output" has started successfully, but the "source" status indicates a streaming error;
No connection: The "output" has not started, and the "source" status is either disconnected or attempting to reconnect;



7.1.5 Other Operations



Saving Presets: When any modifications are made to the intersection points and you leave the interface, a pop-up window will appear asking whether to "Save the existing preset?" You can choose to overwrite the existing preset or save a new preset in the pop-up window.

Loading Presets: Click "Load Preset," and a drop-down window will appear allowing you to select from the pre-configured templates;

Undo: Undo the last operation;

One-key Clear: Clear allCross point on the panel and remove all binding relationships;

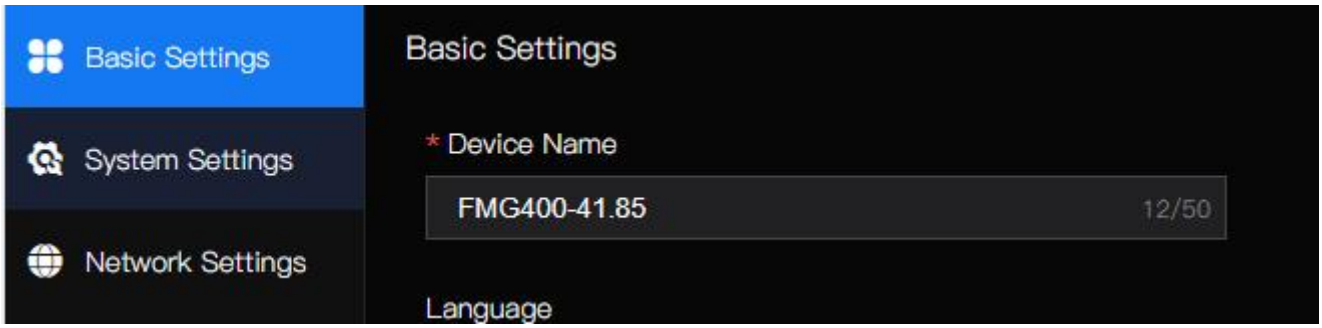
Preset Management: You can modify all preset templates and delete templates.

8 Settings

8.1 General Settings

8.1.1 Device name modification

You can modify the device name by entering the new name in the input box below the device name and clicking "OK".



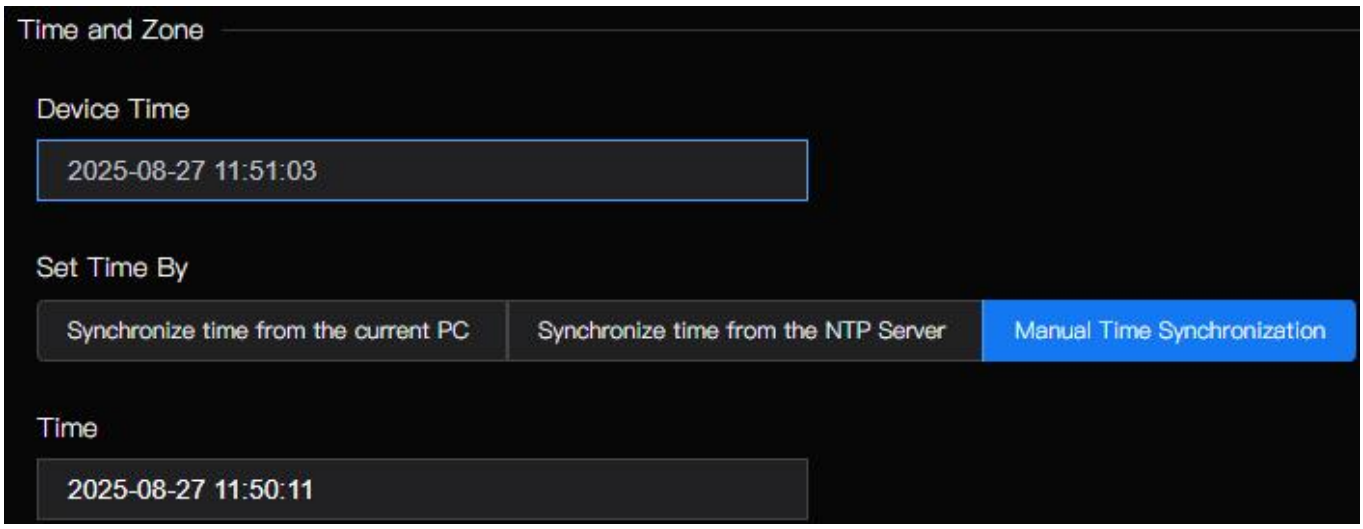
8.1.2 Language modification:

You can change the language by selecting "Chinese" or "English" from the language dropdown menu.

8.1.3 Region and Time:

There are three ways to set the time: synchronize with the current PC, manually set the time, and synchronize from an NTP server.

Method 1: Click "Synchronize with current PC," then click "OK." The device's time will be synchronized with the current PC's time.

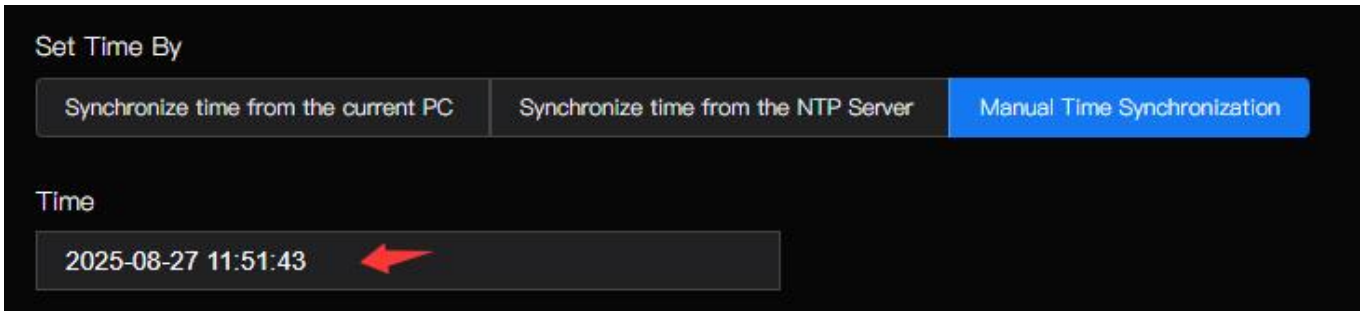


Method 2: Click "Synchronize from NTP server," then enter the desired "NTP server address" in the input box, and then click "OK." The current device's time will then synchronize with the time of the connected NTP server.

Note: Enter the NTP server address(es). Separate multiple addresses with spaces.

Note: Before performing NTP synchronization, please ensure that the "Time Zone" setting above is set to the correct time zone for your region; otherwise, the synchronized time will be inaccurate compared to your local actualtime.

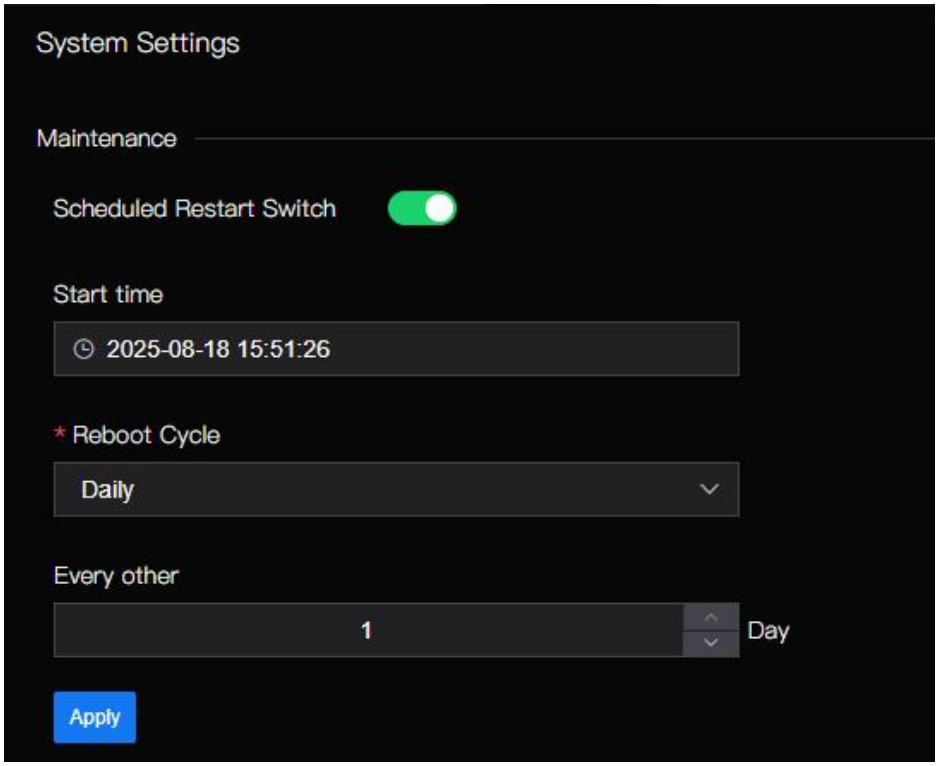
Method 3: Click "Manual Time Synchronization," enter the desired "year, month, day, hour, minute, and second" in the input box, and then click "Confirm." The current device's time will then be synchronized with the set time.



8.2 System Settings

8.2.1 Equipment Maintenance

Equipment maintenance: The user's device software will be restarted, which is equivalent to an automatic scheduled restart of the device, lasting approximately 2 minutes.

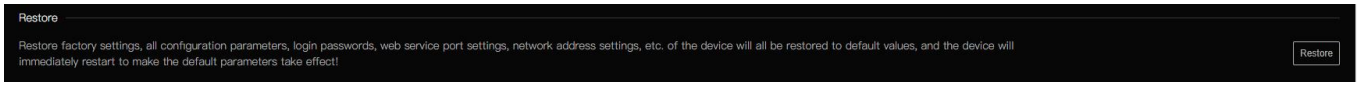


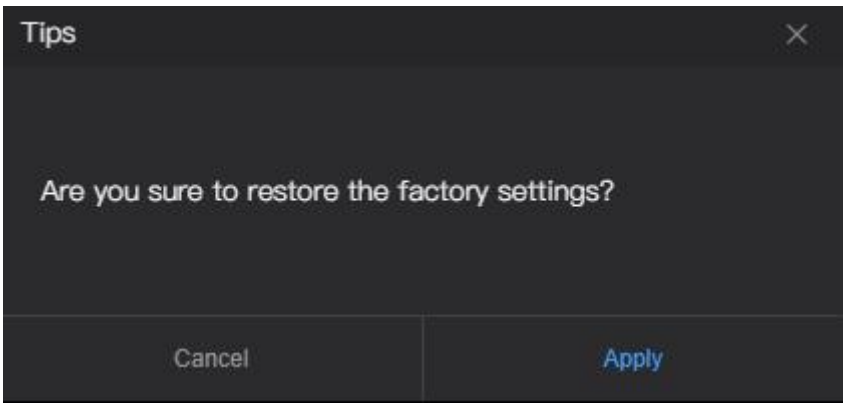
8.2.2 Restore Factory Settings

If a user modifies the parameters and causes the device to malfunction, they can restore the device to its factory settings, returning the device's configuration to its default values.

Restore to factory settings:

1) Go to the web interface's "Settings" - "System Settings" - "Restore Factory Settings" - and then click "Confirm" in the pop-up prompt to complete the operation;





Note：

After restoring factory settings, the following parameters will be restored to their default values:

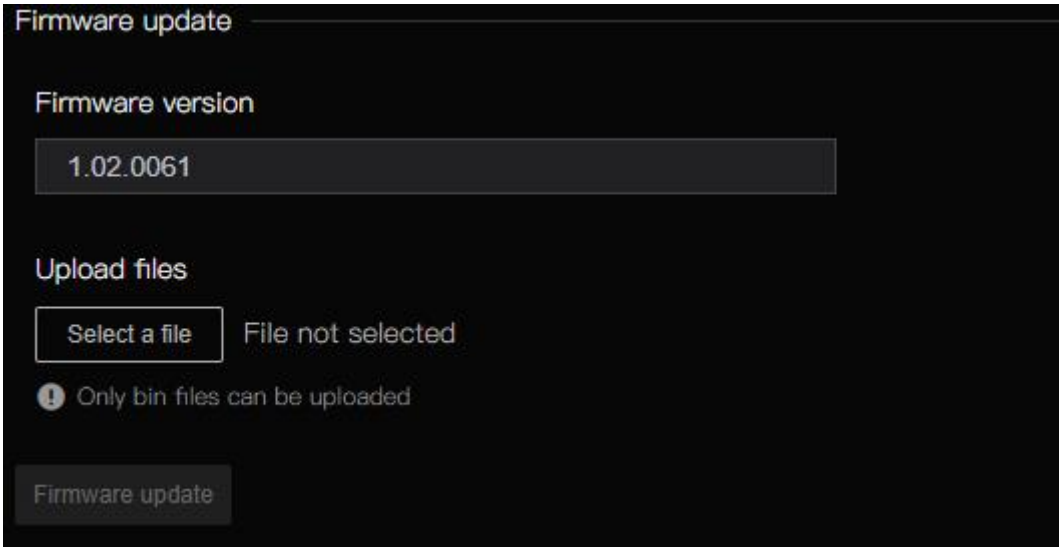
- The login username will be reset to "admin," and the password will be reset to "admin";
- The IP address will be restored to the default value or automatically obtained;
- All configured source and output parameters, panel cross-service settings, etc., will be restored to their factory default values.

8.2.3 Firmware Upgrade

In the web interface, go to "Settings" > "System Settings" > "Firmware Upgrade" > "Select File." A prompt will appear; select the file and click "OK" to add the upgrade package.

“Before upgrading, please verify that the device information and version are correct, then select the upgrade file and click "Firmware update”to start the upgrade.

After the firmware is successfully uploaded, do not disconnect the power during the upgrade process. The device needs to restart to complete the upgrade, which will take approximately 5-10 minutes (depending on the firmware size and network environment).

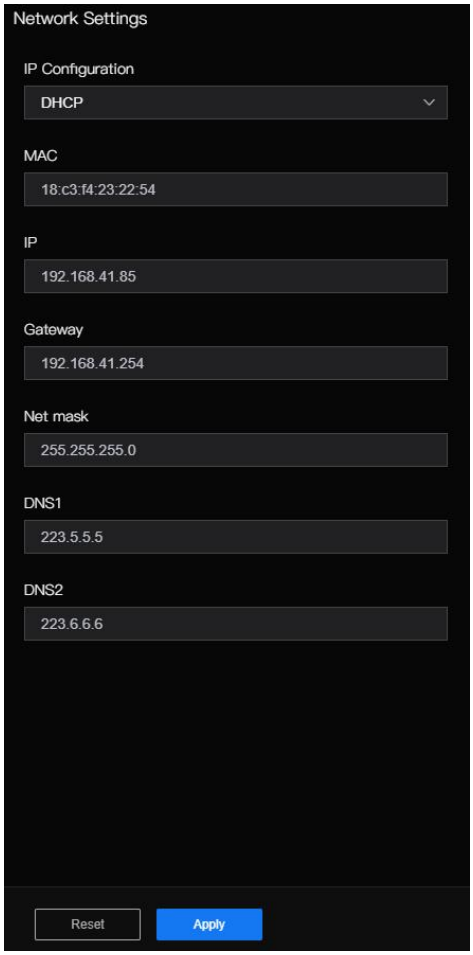


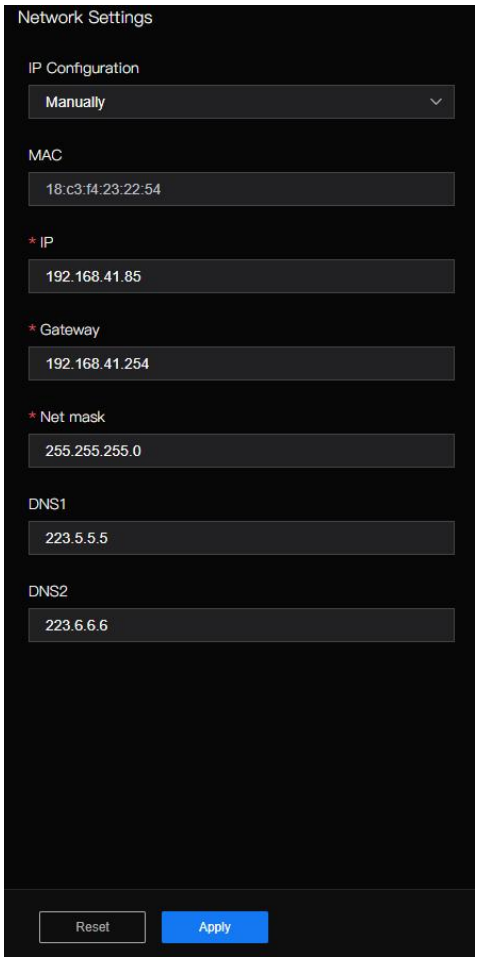
8.3 Network Configuration

There are two ways to configure network settings: manual configuration and DHCP.

8.3.1 To manually specify the network settings, you need to configure the "IP address," "Gateway," "Subnet mask," and "DNS" information, and then click "OK" to complete the process.

8.3.2 The DHCP function will automatically configure information such as "IP address," "gateway," "subnet mask," and "DNS" from the network environment where the FMG-400 is located. Click "OK" to apply the settings.

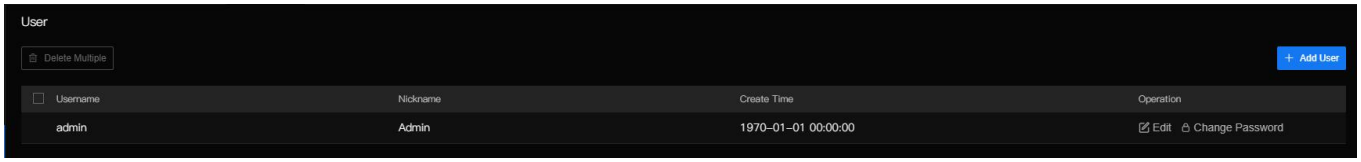




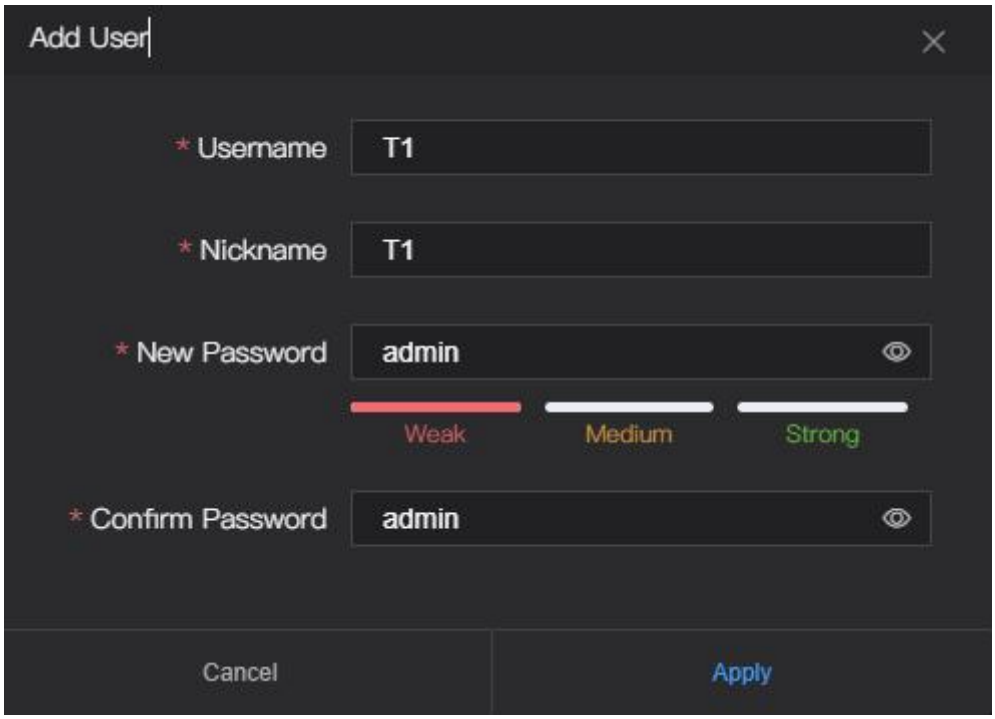
8.4 User Management

Click on Settings > User Management to access the page. The user management list allows you to add users, change passwords, and configure user roles and permissions, as shown in the image below.

View user list

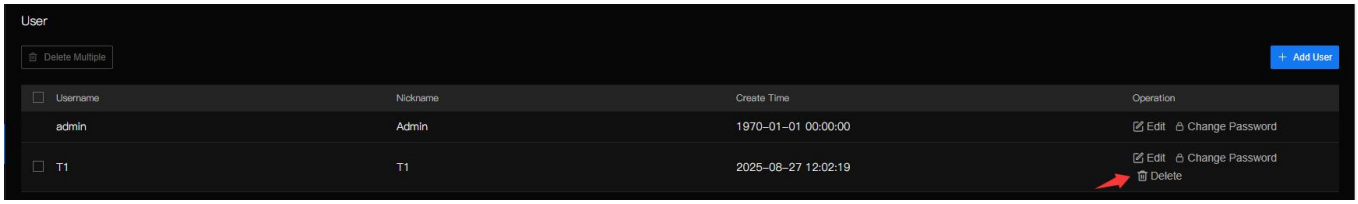


Adding a user: Follow the prompts to enter the "username," "nickname," "new password," and "confirm password," then click "OK" to complete the user addition process.



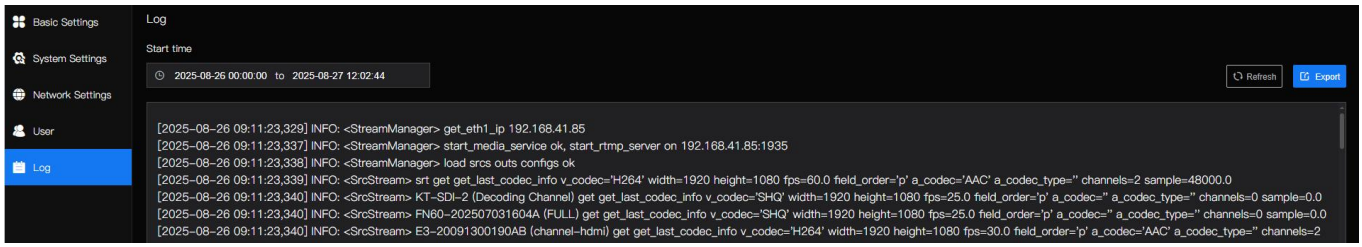
Changing passwords: Select the user(s) whose password you want to change, click the "Change Password" button on the right, enter the "New Password" and "Confirm Password" in the pop-up window, and then click "OK" to complete the operation.

Deleting users: Select the users you want to delete from the list, click the "Delete" button on the right, and then click "Confirm" in the pop-up window to complete the deletion process.



8.5 Log Management

Log management supports selecting a "start time" and "end time" to export the required log information.
Click the refresh button to retrieve the latest device operation logs. Clicking the export button will export all operation logs for the selected time period.



Thank you for reading!

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