



CUBE ENCODER AND DECODER REFERENCE GUIDE



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Thank you for purchasing Cube, the world's first camera-top streaming HD video solution. Cube encoders stream HD video over any IP network. Wireless-enabled Cubes can connect directly to laptops, Cube decoders, mobile devices, or join an existing wireless network to stream over a LAN or WAN. USB-enabled Cubes are also capable of streaming using select 4G capable modems. Cube features native integration with some of the most popular video platforms for turn-key live Internet streaming and content distribution. Use this reference guide to help get the most out of your Cube.

Support Resources

In addition to this reference guide, there are a number of resources available for more information on Cube's features and operation. For tips, information, and all the latest available firmware and software updates, visit Teradek's support forum at <https://support.teradek.com>. If you are unable to find what you are looking for online, please contact Teradek's support staff at support@teradek.com | Phone: (888) 941-2111 Ext. 2 (available M-F 5am-6pm PST).

Disclaimer

This manual is intended for user information only. Every effort has been made to ensure that the contents within are accurate at the time of printing, and that updates are made in a timely manner. Teradek cannot be held responsible for inaccuracies, typographical errors, or out-of-date information contained within this manual.

Warning

Teradek Cube products contain no user serviceable parts. Disassembly, modification, or removal of any of the device's components may void your warranty. Please visit <http://store.teradek.com/pages/warranty-information> for up-to-date warranty terms and conditions.

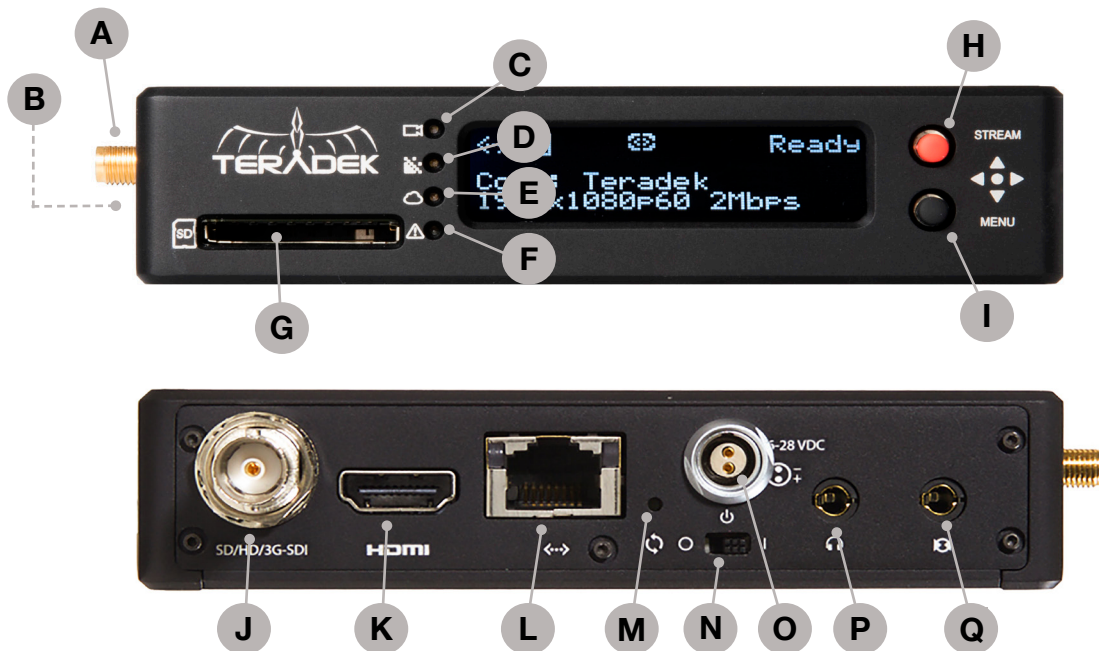
HEVC Products

This product is sold with a limited license and is authorized to be used only in connection with HEVC content that meets each of the three following qualifications: (1) HEVC content only for personal use; (2) HEVC content that is not offered for sale; and (3) HEVC content that is created by the owner of the product. This product may not be used in connection with HEVC encoded content created by a third party, which the user has ordered or purchased from a third party, unless the user is separately granted rights to use the product with such content by a licensed seller of the content. Your use of this product in connection with HEVC encoded content is deemed acceptance of the limited authority to use as noted above.

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PHYSICAL PROPERTIES (CUBE ENCODER/DECODER)



A. RP-SMA connectors
B. USB port
C. Video input status
D. Codec status
E. Broadcast status
F. Fault/Error

G. SD card slot
H. Stream joystick
I. Menu joystick
J. SD/HDMI/3G-SDI input/output
K. HDMI input/output
L. 10/100/1000 Ethernet

M. Reset button
N. Power switch
O. Power input
P. 1/8" headphone output
Q. Mic/Line stereo input

START/STOP AND MENU JOYSTICKS

Use the Stream and Menu Joysticks (Fig. 2-1) to navigate the front panel interface.

Stream Joystick:

● (button press): Access quick menu actions, exit menu screens, start/stop recordings and broadcasts

Menu Joystick:

▲, ▼, ◀, ▶: Select menu items, change status screen on main display, select character.

● (button press): Confirm selection, open selected menu.



Fig. 2-1

GETTING STARTED

There are three key steps to getting started with Cube:

1. Power your device.
2. Connect to a network.
3. Choose your application.

POWER YOUR DEVICE

1. To power Cube, connect the AC adapter using the 2-pin connector marked '6-28 VDC Input (Fig. 2-2), then turn the power switch to the On position. Cube begins to boot as soon as power is connected. **NOTE:** The codec LED blinks to indicate Cube is booting. This process takes approximately 1½ minutes.
2. Turn on your video source, then connect it to Cube using either an SDI or HDMI cable (Fig.2-3).
3. Attach the antenna (if applicable) via the threaded RP-SMA connector.
4. Attach any mounting accessories, such as the enclosed hot shoe mount, if desired.
5. Once Cube has booted, verify that the Video Input Status and Codec LEDs are illuminated, indicating a video source has been successfully detected (Fig. 2-4) and the codec is ready. If using a Cube decoder, the codec LED will remain off until it is configured (see page 10).



Fig. 2-2



Fig. 2-3



Fig. 2-4

CONNECT TO A NETWORK

Cube allows you to connect to a network using Wi-Fi, an Ethernet connection, or a USB modem. Use the front panel interface or the web user interface (web UI) to connect Cube to a network.

Connect via wireless (Wi-Fi)

1. Using the Menu joystick, navigate to the **Network Setup** menu, then select **WiFi**.
2. Press the Menu joystick to enter the WiFi mode menu, then select a mode:
 - a. **Access Point (AP) Mode** - **AP Mode** is automatically enabled by default. Connect your computer to Cube's AP network: Teranet-XXXXX (serial number of the device).
 - b. **Infrastructure Mode** - Select **Infrastructure Mode**, then **Scan for Networks**. Select a Wi-Fi network (Fig. 2-5), then enter your credentials.
3. To obtain the IP address, select **[Status]**, or press ▼ on the menu joystick from the main screen.

Access the web UI

The web UI can be accessed by using any available network interface. Simply open a web browser and enter the network's IP address in the navigation bar (Fig. 2-6). If using a USB modem, connect your computer to Cube's AP network first, then enter the IP address in the navigation bar.



Fig. 2-5

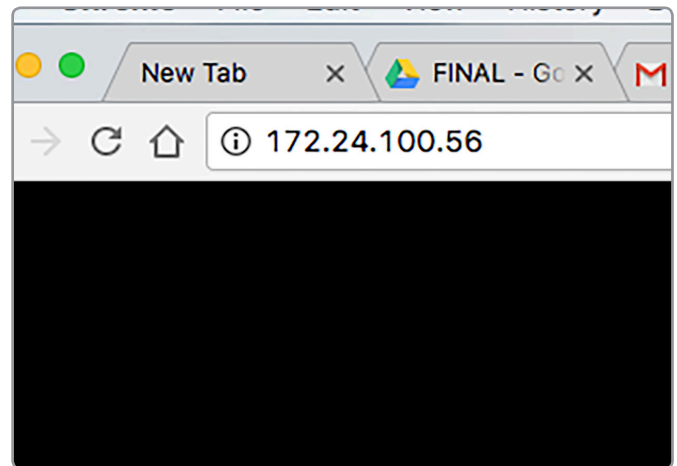


Fig. 2-6

Connect to an Ethernet network (Wired)

1. Plug an Ethernet cable into Cube's Ethernet port (Fig. 2-7) and connect it to an Ethernet switch or router.
2. Once Cube is connected to the network, the front panel interface will indicate that it's "Ready" (Fig. 2-8).
3. To obtain the IP address, press ▼ on the menu joystick, or navigate to the **Wired** menu, where it will be displayed.



Fig. 2-7



Fig. 2-8

Connect using a USB Modem:

1. Insert a compatible 3G/4G USB modem into the USB port (Fig. 2-9) and wait for the cellular reception icon (4 bars) to appear.
2. To confirm the modem is connected, navigate to the **Network Setup** menu and select **USB Modem**.

For additional configuration options, see page 16.

CHOOSE YOUR APPLICATION

Cube can be used for a variety of applications, such as live production and monitoring on Teradek's iOS apps, streaming to the Internet, or transmitting to a decoder.

Connect and Broadcast using Live:Air Action

1. Connect your iPad to the same network as Cube.

Live:Air Action or Live:Air Solo

Live:Air Action is compatible with iPad Air 1 and newer. Live:Air Solo is compatible with both iPad and iPhone. Both apps are available in the iTunes App Store.



2. Launch the Live:Air Action app.
3. Tap the **Add New Source** button on the Preview Editor's bottom panel, then tap the **Teradek Device** button. Select a device (Fig. 2-11), then tap **Done**.
4. To configure a streaming destination, tap the **⚙️** button in the upper right-hand corner, enter the **Broadcasting Destinations** page, then navigate to **Manage Destinations>Add a Destination** (Fig. 2-12). Select a platform, then enter your credentials (if applicable).
5. To begin live streaming, tap the **'Go Live!'** button in the upper right-hand corner.



Fig. 2-9

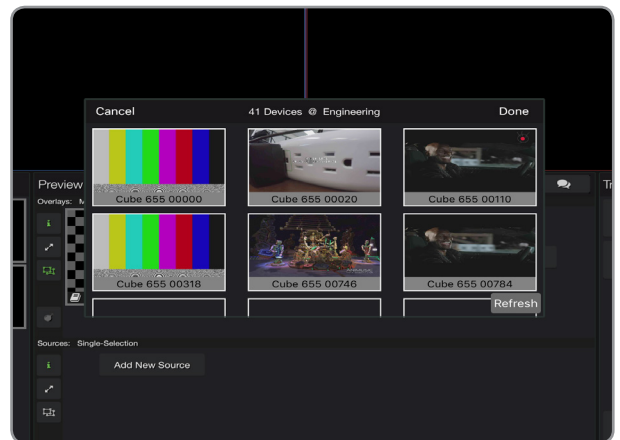


Fig. 2-11

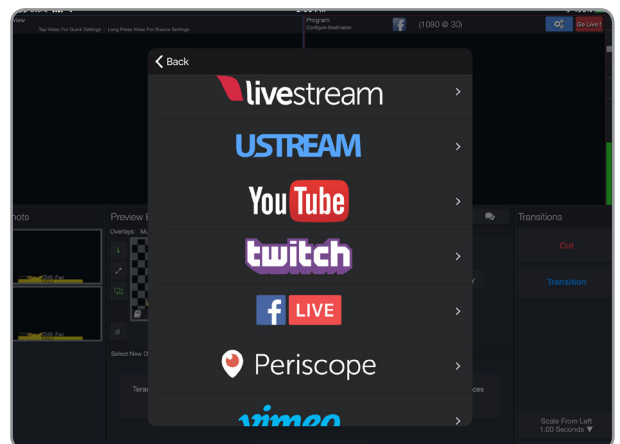


Fig. 2-12

Monitor using VUER

1. Set your stream mode to **Live:Air**.
2. Connect your iPad to the same network as Cube.
3. Launch the VUER app.
4. From the VUER app, tap the **CAMERA** button in the upper left-hand corner (Fig. 2-13), select your device(s), then tap **Done**.



Fig. 2-13

Stream to an Internet Platform

1. From the **Video Stream Output** menu, select **Internet Streaming** as your stream mode (Fig. 2-14).
2. Select a streaming platform provider (Fig. 2-15) and enter your credentials, or follow the on-screen prompts to authorize Cube.
3. Select a channel or event to stream to.
4. After configuring your device, navigate back to the main display.
5. Press the Stream Joystick (see page 7) or tap the **Broadcast** button to go live.

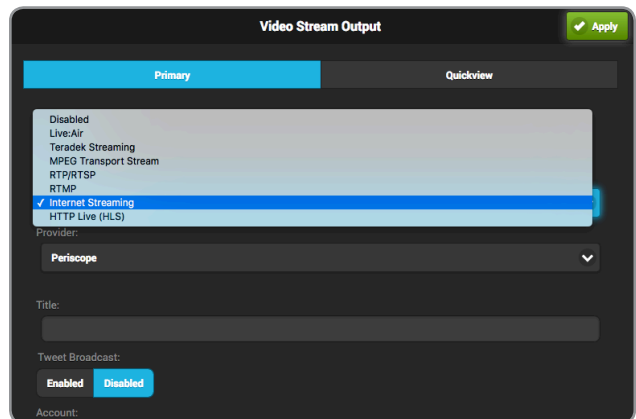


Fig. 2-14

BROADCAST BUTTON:



Cube is ready to broadcast



Broadcast is in session



Cube is not ready to broadcast

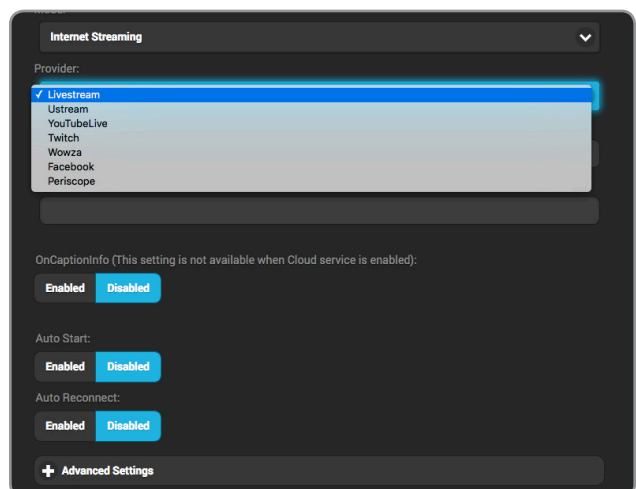


Fig. 2-15

Transmitting to a Decoder

If you purchased a Cube decoder along with the encoder, use the following steps to pair the two devices.

1. From the encoder's front panel, navigate to the **Streaming Setup** menu, then select **Primary Stream**. If using the web UI, navigate to the **Video Stream Output** menu, then select **Primary** (see page 9).
2. From the decoder's front panel, navigate to the **Decoder Setup** menu. If using the web UI, navigate to the **Video Stream Source** menu (Fig. 2-16).
3. Ensure that the both the Cube encoder and decoder are on the same network, and using the same stream mode and protocol.

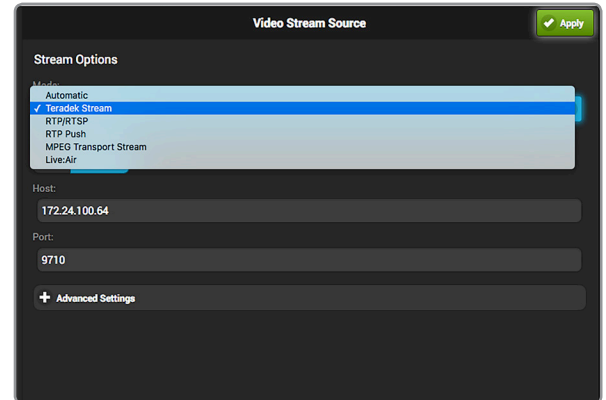


Fig. 2-16

CHOOSE A STREAMING MODE

Cube encodes and streams video using a variety of stream modes. Use the following steps to view, modify, or select a streaming mode to best suit your application.

1. Navigate to the **Streaming Setup** menu using the Menu joystick, then select **Primary Stream**. If using the web UI, navigate to the **Video Stream Output** menu, then select **Primary** (Fig. 2-10).
2. Select one of the following Stream Modes:
 - **LIVE:AIR**
 - **TERADEK STREAM (TDS)**
 - **MPEG TRANSPORT STREAM (LICENSE REQUIRED)**
 - **INTERNET STREAMING**
 - **RTMP**
 - **RTP/RTSP**
 - **HLS (HTTP LIVE)**

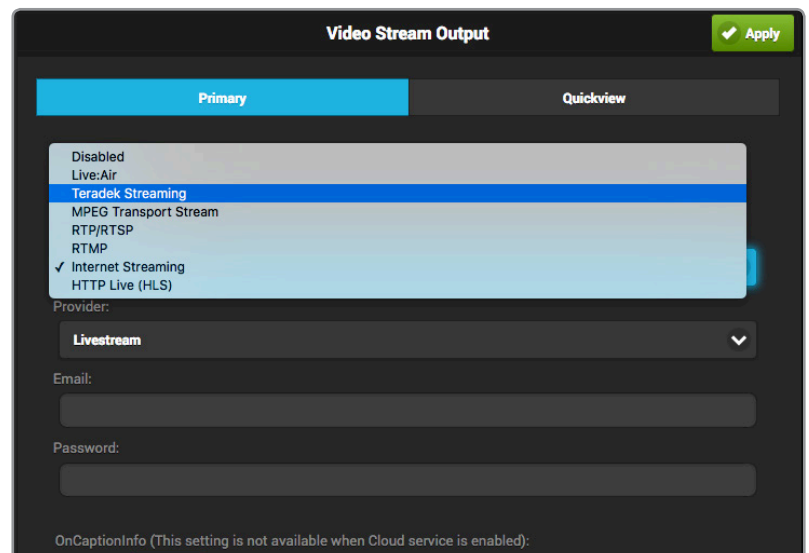


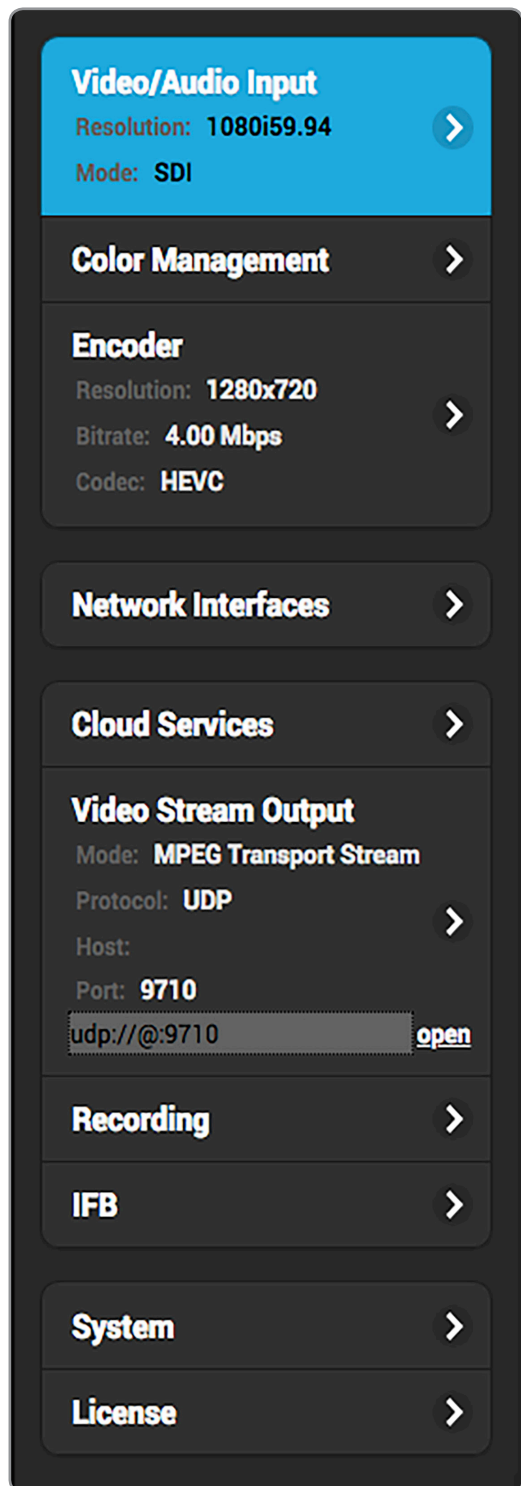
Fig. 2-10

See page 18 for Stream Mode descriptions and applications.

ENCODER CONFIGURATION

NAVIGATING THE SETTINGS MENU

The Settings menu allows you to customize and control Cube's broadcast, audio/video, and network settings. Use the web UI or the front panel interface to access and modify the settings. **NOTE:** This section illustrates the settings as they are available on the web UI. These settings can also be configured from Cube's front panel interface (see page 11).



VIDEO/AUDIO INPUT: Contains options for configuring your video/audio input, Test Pattern, and Deinterlacer preferences.

COLOR MANAGEMENT: Allows you to select 3D LUT and CDL files stored on your computer to apply to your video output.

ENCODER: Adjust the codec, bitrate, resolution, frame rate, and other key features related to your **Primary** or **Quickview** stream. Options include:

- Codec
- Resolution
- Key Frame Interval
- Bitrate
- Frame Rate
- Advanced Options
- Audio Bitrate
- Max Frame Rate
- Overlay

NETWORK INTERFACES: Contains options for configuring Ethernet, Wi-Fi, and USB modem interfaces.

CLOUD SERVICES: Allows you to access and manage Core, Teradek's cloud service management service.

VIDEO STREAM OUTPUT: Select and configure a streaming mode and broadcast destination. Options include:

- Live:Air
- MPEG-TS (license required)
- Internet Streaming
- Teradek Streaming
- RTP/RTSP
- HTTP Live (HLS)
- SRT
- RTMP

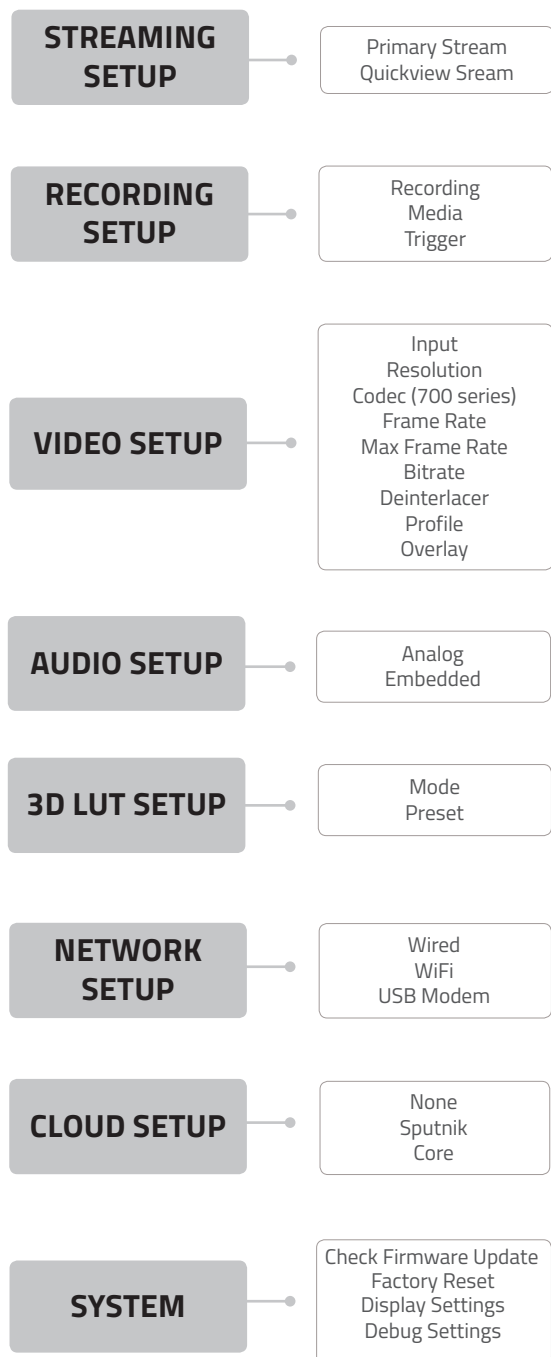
RECORDING: Enable or disable recording and select a media storage option.

IFB: Contains options for configuring two-way audio communication.

SYSTEM: Perform factory reset, firmware upgrade, system diagnostics, and other essential functions.

LICENSE: Add, import, or export license files for additional functionality.

FRONT PANEL INTERFACE SETTINGS



STREAMING SETUP: Configure a streaming mode option and/or broadcast destination for the **Primary** stream, or enable the **Quickview** stream. Primary stream options include:

- Live:Air
- MPEG-TS (license required)
- Internet Streaming
- Teradek Streaming
- RTP/RTSP
- HTTP Live (HLS)
- SRT
- RTMP

RECORDING SETUP: Enable or disable the recording feature, and select a recording trigger and media storage option.

VIDEO SETUP: Adjust the codec (700 series only), bitrate, resolution, frame rate, and other key features related to your stream. Options include:

- Input
- Frame Rate
- Deinterlacer
- Resolution
- Max Frame Rate
- Profile
- Codec (Cube 700)
- Bitrate
- Overlay

AUDIO SETUP: Allows you to configure an audio input source.

3D LUT SETUP: Enable or disable a look preset, or display a split screen view.

NETWORK SETUP: Contains options for configuring Ethernet, Wi-Fi, and USB modem interfaces.

CLOUD SERVICES: Allows you to enable Core, Teradek's cloud service management service.

SYSTEM: Perform factory reset, firmware upgrade, and modify your display settings.

VIDEO/AUDIO INPUT

The Video/Audio Input menu contains several input source configuration and video overlay options.

Video Input Source - Video Input Source lets you select the type of signal providing the video source.

Deinterlacer - The Deinterlacer converts interlaced video into progressive video before streaming, improving the appearance of video that has been scaled down from the original input resolution. In addition to supporting scaled down interlaced video, deinterlacing is also useful when streaming to the Internet or mobile devices instead of a decoder.

1080p 50/60 Handling (600 series encoders only) - Select whether to convert your video input to progressive video (Half Framerate) or interlaced video (Interlacer).

Progressive (50/60) Output (700 series encoders only) - With the Deinterlacer enabled, select whether your your stream is transmitted in 1080p60 (Enabled), or 1080p30 (Disabled).

SDI Ancillary Data (600 series encoders only) - Extract Timecode or Closed Captions data from the SDI input and embed it into your stream.

Test Pattern Broadcast a test image when no video is connected. Setting Force to Enabled allows the encoder to stream a test pattern (Fig. 3-1, 3-2) regardless of the video connection.

Audio Input Source - Configure the audio input source. Selecting Embedded (HDMI) allows you to enable or disable L/R audio channels. Selecting Analog allows you to manually adjust the volume. Selecting Disabled produces a silent stream.

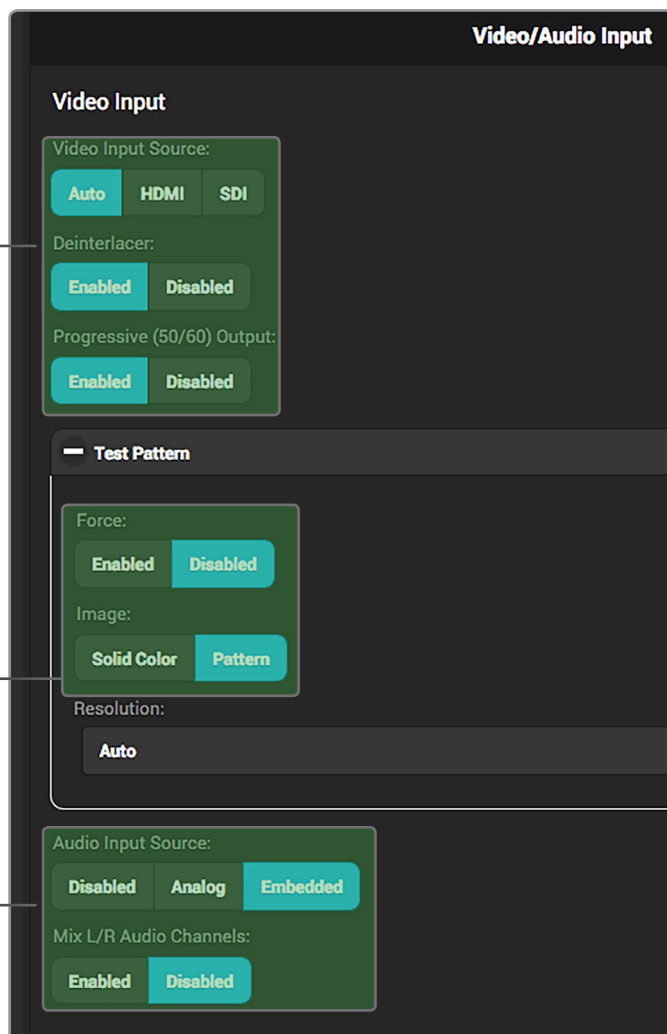


Fig. 3-1: Test pattern - solid color image



Fig. 3-2: Test pattern - pattern image

COLOR MANAGEMENT

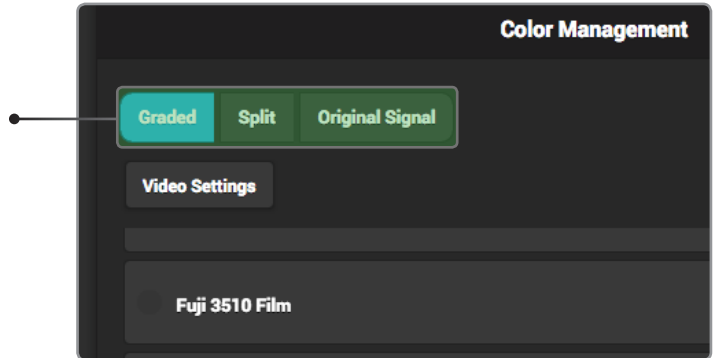
The Color Management menu contains options for adding specific looks from your computer and saving them to Cube's interface. These looks can either be 3D LUT files, CDL preset files, or files composed of both formats. Use this menu or the front panel interface to apply presets to the video output. Up to 32 looks can be stored on the device.

Color Management options

Graded - Enable a look preset

Split - Display a split screen view of the original image and any selected preset

Original Signal - Transmit the input source's original look without a look preset



Creating a Look

Look presets can be created from a 3D LUT and either an ASC CDL file or 1D LUT + Saturation files.

1. Select **Add a new Look**.
2. Enter a name for your look under the name field. If a name is not entered, the look will use the same name as the 3D LUT filename. Names can be up to 32 characters long.
3. Select whether you would like to load a CDL file (Fig. 3-3), or a 1D LUT file + Saturation file, then click **Choose File** to select the file(s) from your computer.
4. Select **Choose File** under the 3D LUT section and pick the 3D LUT file you wish to use.

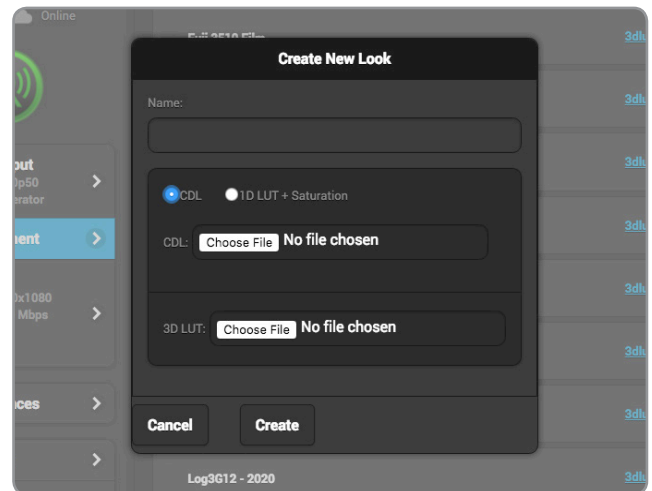


Fig. 3-3

Organizing look presets (Fig. 3-4)

Arrange look presets either by dragging the desired preset up and down on the list or clicking the ↑ or ↓ icons.

Deleting looks

Look presets can be deleted by clicking the **X** button located in the look's listing.

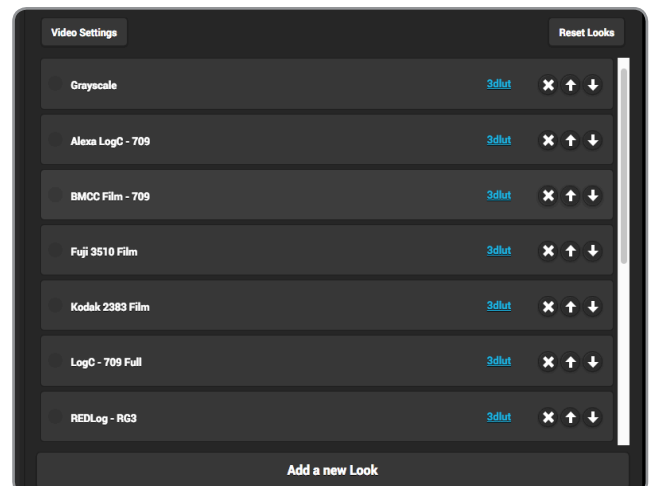


Fig. 3-4

ENCODER

With Cube, you can control various characteristics of the network video stream, such as bitrate, frame rate, and resolution. Use this section to help you adjust the video stream to best suit your streaming environment. The **Primary** stream offers a complete set of options that are fully configurable; a subset of those options are available for the **Quickview** stream.

Encoder Options

Codec (700 series encoders only) - Select either HEVC or H.264 compression formats.

Bitrate and Audio Bitrate - Select your stream's target bitrate. Lower bitrates require less bandwidth and may allow for a more stable stream while higher bitrates offer better video quality, but require more network bandwidth.

Resolution - Scale down the encoder's input resolution or maintain the input's native resolution.

Frame Rate - Set the encoder frame rate to full frame rate or a fraction of the input frame rate.

Max Frame Rate - Manually enter your stream's target frame rate.

Key Frame Interval - Adjust the amount of time between full picture refreshes. By default, the encoder generates one key frame every two seconds.

Advanced Options

Caching* - This value can be left at its default (300 ms) in most cases. Decreasing the value reduces overall latency, but video quality and stability may deteriorate. Increase this value if your video stream stability is affected by a poor or challenging network environment.

Audio Sample Rate - Set the encoder audio sample rate.

Aspect Ratio* - Select the encoder aspect ratio -- Either Auto, 4:3, or 16:9.

Use Square Pixels* - This feature can be left enabled unless used with a decoder that requires non-square pixels. When enabled, the horizontal resolution is adjusted to set the picture aspect ratio (1:1 pixel aspect ratio). If disabled, the pixel aspect ratio varies to determine the picture aspect ratio.

Compression Profile - High profile encoding typically gives the best image quality at a given bitrate. Main and Baseline profiles utilize slightly different features, and may be more compatible with some decoders.

Frame Structure* - Select Macroblock-adaptive frame-field (MBAFF), frame, or field coding for interlaced video encoding.

SEI Timing* - Enable or disable SEI timing. This should be left enabled unless required for a particular stream application.

Overlay

Title - Overlay text or images onto your video stream, then adjust the appearance and location of text.

Image - Overlay imported images onto your video stream, then adjust the location of the image.

Rate Control

Mode - Select **Auto**, **Manual**, or **Debug***. Additional options are present when set to Manual or Debug mode.

Static Scene Detection* - Prevents bitrate spikes during static-to-dynamic scene transitions when enabled. Improves video quality in mostly static scenes when disabled.

Complexity Detection* - Allows the encoder to adapt more quickly to very complex content and scene changes.

Zero Padding* - The stream is held at the configured bitrate. Extra data is added to the stream to "pad" the bitrate if it would otherwise drop below the configured value, preventing the bitrate from exceeding the configured value.

** 600 series encoders only*

Encoder Settings Considerations

- Encoder settings will vary based on the bandwidth available and the platform used.
- Always select a video bitrate that is less than 70% of the total upload bandwidth available on the Internet connection (i.e. if 5 Mbps is available, set the video to 3.5 Mbps or lower).
- Some platforms (i.e. YouTube) will automatically generate lower quality streams from a high quality input (transcoding), so the highest possible quality can be used. If the streaming platform does not transcode the video, consider that your viewers must have the available download bandwidth to view the stream.

NETWORK INTERFACES

Cube allows you to connect and stream to the Internet by utilizing one of several network interfaces.

Wired

A wired Ethernet connection is typically the most reliable means for connecting to a network, as you don't have to deal with the instability of a Wi-Fi or cellular connection. To configure the Ethernet interface, select **Wired** from the **Network Interfaces** page, then click **Modify** (Fig. 3-5).

IP Address Modes

Dynamic (DHCP) - The connected router generates an IP address, allowing Cube to be automatically configured.

Static - Manually configure the IP address settings if a DHCP server is not available, or if applications require a fixed address.

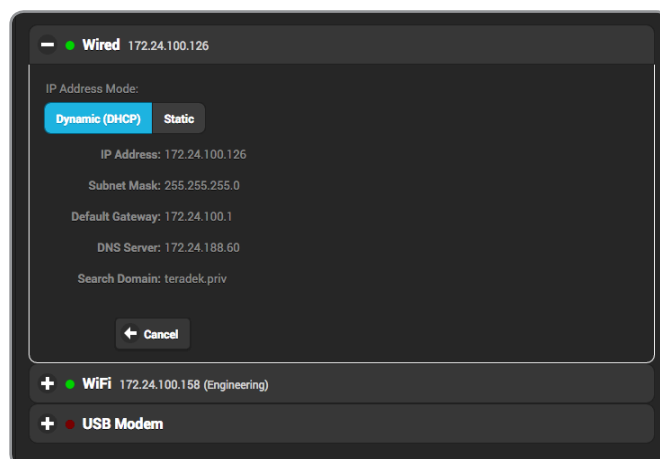


Fig. 3-5

Wireless (Wi-Fi)

Although an Ethernet connection is the most reliable method of connecting to a network, a Wi-Fi connection may be more convenient, especially if an Ethernet connection is unavailable. There are two Wi-Fi modes available; **Access Point (AP)** Mode and **Client (Infrastructure)** Mode (Fig. 3-6).

Wi-Fi Modes

Access Point (AP) Mode - Cube acts as its own dual band access point, allowing you to connect your device directly to Cube's AP network.

Client (Infrastructure) Mode - Cube and your device connect to the same local wireless network. Access Client Mode, then click **Browse** to scan for available networks (Fig. 3-7), or **Saved Networks** to connect to a previously saved network, then enter your credentials.

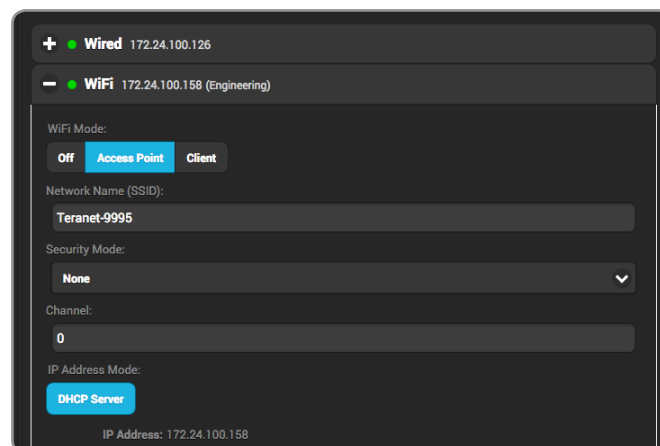


Fig. 3-6

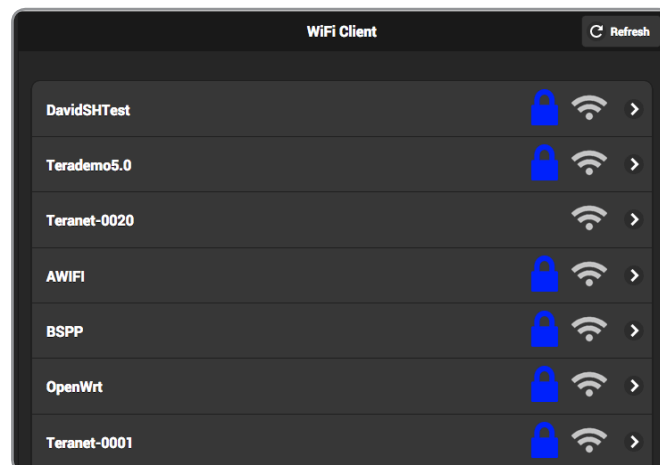


Fig. 3-7

NETWORK INTERFACES (CONT.)

USB Modem

A USB modem allows you to broadcast wherever a cell connection is available. Cube automatically detects and supports many modems using the **Auto** setting. If you need to configure a modem, connect to Cube (see page 17) and insert the USB Modem into Cube (Fig. 3-8).

From the **Network Interfaces** page, select **USB Modem**, then select a configuration mode.

Configuration Modes

Auto (default): The modem is automatically detected and configured. Cube supports many modems worldwide using this setting.

Preset: Contains configurations for modems that are supported but cannot be auto detected. User credentials are required if the modem account is password protected.

Custom: Allows you to manually configure a modem if it's not automatically detected. Available configuration modes are **GSM**, **CDMA**, **Composite**, and **Ethernet**. Modes will vary based on the modem model and mobile network provider.

In addition to the above configuration modes, you can also select from several supported modem configurations (Fig. 3-9). Visit <http://support.teradek.com> for more information about specific modem models.



Fig. 3-8

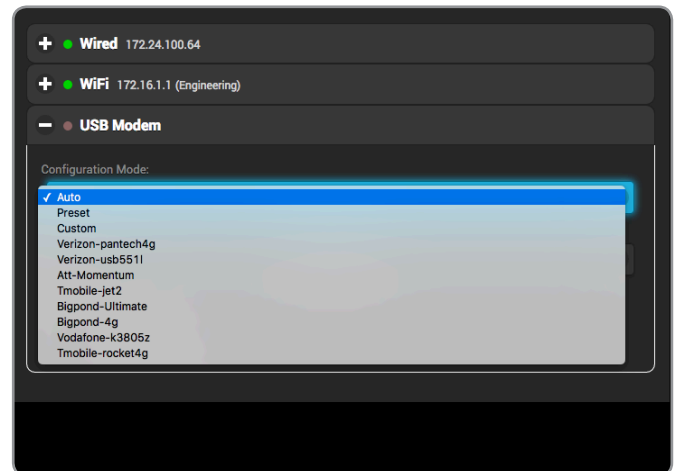


Fig. 3-9

CLOUD SERVICES

Cube encoders and decoders can be remotely accessed, configured, and controlled using Teradek's CORE Cloud management and routing service.

CORE

CORE Cloud Service

CORE is a professional cloud-based solution for managing, archiving, and routing Teradek encoders and decoders.



With CORE, you can:

- Bond multiple Internet connections, increasing your broadcast's bandwidth and reliability
- Remotely control Teradek encoders, decoders and bonded systems from anywhere in the world
- Route live video feeds to multiple destinations and streaming platforms using a simple drag-and-drop web UI
- Easily connect encoders and decoders through firewalls
- Record streams from encoders and archive them to the "cloud" in real time

To get started, select CORE, then click **Apply** in the upper right-hand corner:

1. Sign up for CORE, then log in from the web UI (Fig. 3-10).
2. Select an account (company), then click **"Not Configured..."** to select a Sputnik server. If one isn't available, open the CORE dashboard and navigate to **Inventory>Sputniks**, then select **Add Sputnik** to configure a Sputnik server.
3. After selecting a Sputnik (Fig. 3-11), click **Apply** in the upper right-hand corner. Return to the web UI and select Refresh to display the Sputnik server.
4. Once a connection is established, you can configure and control Cube from the CORE dashboard (Fig. 3-12).

Visit <http://core.teradek.com> to learn more and to create an account.

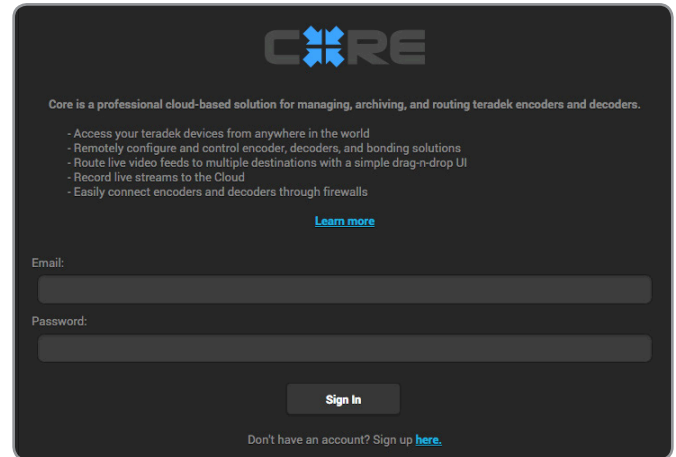


Fig. 3-10

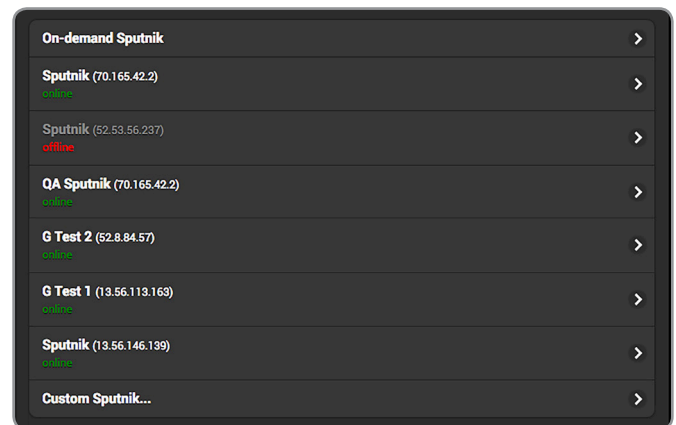


Fig. 3-11

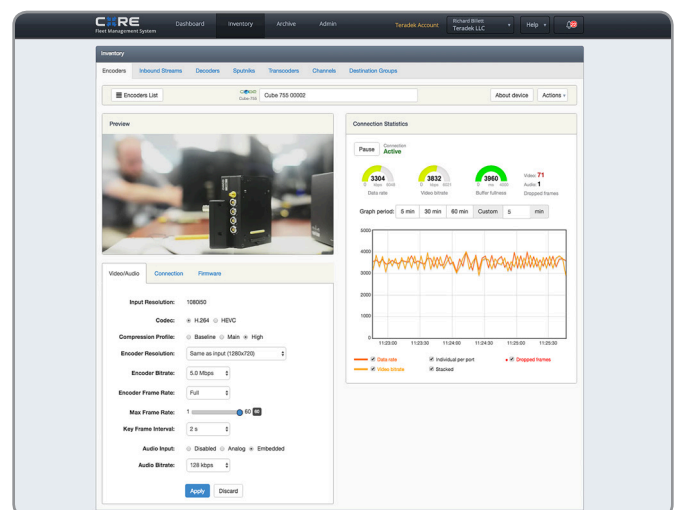


Fig. 3-12

VIDEO STREAM OUTPUT

Depending on the video's destination, you can pick from a variety of different stream modes, each with it's own set of configurable settings described here.

LIVE:AIR

Live:Air Action is a video production suite that can receive feeds from any Cube encoder for real-time video mixing, switching and even transitions. Once you've configured Cube to stream in Live:Air mode, you can manage it from the Live:Air Action (see page 7) or VUER apps (see page 8).

TERADEK STREAMING (TDS)

TDS is specifically optimized for local streaming with minimum latency between Teradek devices. Configure TDS by entering the IP address and destination port of a Teradek decoder.

MPEG TRANSPORT STREAM (MPEG-TS)

To stream over MPEG Transport Stream, you'll first need to purchase the license from Teradek. In MPEG Transport Stream Mode, Cube sends video via a TCP or UDP protocol to a specified unicast or multicast address. TCP is recommended when streaming over the Internet, while UDP is recommended when streaming over a local network to avoid the additional network overhead of TCP. Select the protocol best suited for your application needs, and ensure the Cube encoder is configured to stream to the Cube decoder's corresponding IP address and port.

SRT

SRT is used to transmit high quality, low-latency video over unreliable networks. SRT has two connection types: **Listener** or **Caller**. When the connection type is set to **Listener**, the encoder waits for the client to connect and pull the stream from it. When the connection type is set to **Caller**, the encoder pushes video to a single destination IP address on a specific port. For either mode, a port number is needed, and a passphrase (if encryption is enabled). For a direct connection (Caller mode), enter the correct destination IP address.

CONFIGURABLE SETTINGS

- Advanced Settings
 - *Buffer* - *Max Clients*

-
- Host
 - Port
 - Advanced Settings
 - *Buffer* - *Packet Size*
 - *Protocol* - *DSCP*

-
- Protocol (*UDP/TCP/Multicast*)
 - Host
 - Port
 - MPEG-TS Server Mode
 - Advanced Settings
 - *Audio Codec* - *PSI Period*
 - *Packet Size* - *DSCP*
 - *PCR Period*
 - Constant Bitrate
 - Adaptive Bitrate (*TCP only*)
 - Transport Stream Info

-
- Connection Type
 - Host (Caller)
 - Port
 - Encryption
 - Latency
 - Adaptive Bitrate
 - OnCaptionInfo (*700 series only*)

RTP/RTSP

Cube is configured to stream via RTSP by default. RTSP is used for local streaming to computers and Cube decoders. When RTP/RTSP mode is enabled, the decoder communicates whether to use the TCP or UDP protocol for the stream. Ensure you have the correct port and stream name (*stream1* is the default). To view your stream on VLC, copy the link displayed under Video Stream Output panel in the Settings Menu (Fig. 3-14). To view an RTSP stream, launch VLC and navigate to **File>Open Network**. Paste the link in the URL field, then click **Open**.

RTMP

RTMP mode allows Cube to stream to other video platforms, CDNs, and streaming servers that are not one of the available Internet Streaming platforms (see below). RTMP is supported by most video streaming platforms, but you must first obtain a URL and stream key/name from the service you choose to stream to. Log into your account's settings and retrieve the URL and stream key/name.

HTTP LIVE (HLS)

HTTP Live streaming (HLS) is supported natively by iOS-based devices and desktop computers (Mac OS X). Due to unreliable network conditions, local streaming to a browser or iOS device will have a higher degree of latency. For low latency streaming to iOS devices, use Live:Air mode with Teradek's Live:Air Action, VUER, or TeraView apps.

INTERNET STREAMING

Cube features native integration with some of the most popular streaming platforms. Select a provider (platform), then enter your credentials and/or destination information.

Integrated Platforms

Livestream (pg. 20)
Ustream (pg. 21)
YouTube Live (pg. 22)
Twitch (pg. 23)

Wowza (pg. 23)
Facebook (pg. 24)
Periscope (pg. 25)

CONFIGURABLE SETTINGS

- Stream
 - Port
 - RTSP Authentication
 - Username
 - Password
-
- RTMP Server URL
 - Stream
 - OnCaptionInfo
 - Auto Start
 - Auto reconnect
 - Advanced Settings
 - Backup URL
 - Password
 - User Agent
 - DSCP
 - Username
-
- No Configurable Settings
-
- Provider
 - Livestream
 - Ustream
 - YouTube Live
 - Twitch
 - Username
 - Password
 - OnCaptionInfo
 - Auto Start
 - Auto reconnect
 - Advanced Settings
 - DSCP

Livestream:

1. Select **Livestream** and enter your credentials (Fig. 3-13).
2. Select the event you wish to stream to (Fig. 3-14), or create a new event at <https://livestream.com>.
3. After selecting an event, you will be redirected to the **Video Stream Output** page. Select **Apply** on the upper right corner.
4. Tap the **Broadcast** button to go live, then select whether or not to notify your followers (Fig. 3-15).

Notify Followers

If broadcasting from Cube's web UI, you can notify your account's followers by toggling the '**Notify Followers**' switch to **On** before tapping the broadcast button.

5. When ending the broadcast, select whether to **Post**, **Save**, or **Delete** the video from the event (Fig. 3-16).

Post, Save, or Delete

During your broadcast, you can select whether to **Post** the recorded video immediately, **Save** it for posting later, or **Delete** it from the event.

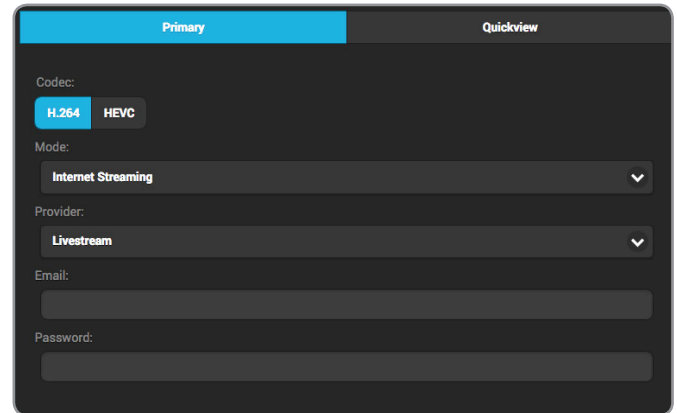
A screenshot of a mobile application interface for configuring a livestream. At the top, there are two tabs: 'Primary' (selected) and 'Quickview'. Below the tabs, there are several input fields: 'Codec' with buttons for 'H.264' (selected) and 'HEVC'; 'Mode' with a dropdown menu showing 'Internet Streaming'; 'Provider' with a dropdown menu showing 'Livestream'; 'Email' with a text input field; and 'Password' with a text input field.

Fig. 3-13

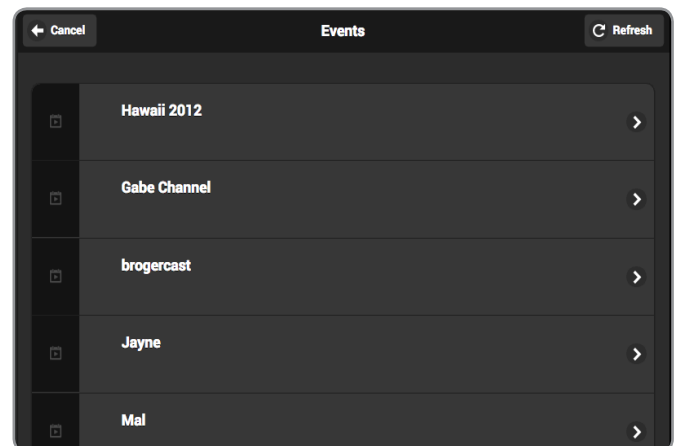


Fig. 3-14

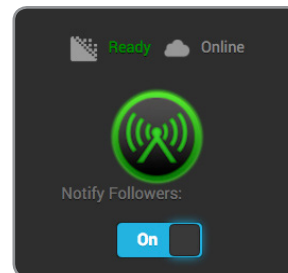


Fig. 3-15

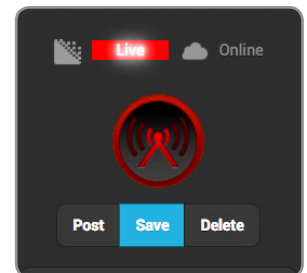


Fig. 3-16

Ustream:

1. Select **Ustream**, enter your credentials, then select **Apply** in the upper-right corner (Fig. 3-17).
2. Select an available channel to stream to from the Channels List (Fig. 3-18), or create a new channel at <https://www.ustream.tv>.
3. After selecting a channel, you will be redirected to the **Video Stream Output** page. Tap the **Broadcast** button to go live.

Auto Record and recorded files

Depending on your Ustream account level, broadcasts to your channel may be automatically recorded for viewing later. Enabling the '**Auto-Record**' setting (Fig. 3-19) triggers these recordings. Access permissions for the recorded files can be configured on your Ustream account.

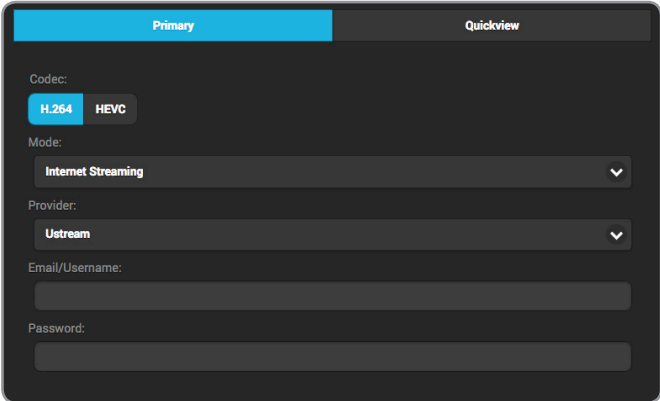
The image shows a mobile application screen titled 'Primary' with a 'Quickview' tab. It contains a 'Codec' section with 'H.264' selected and 'HEVC' as an option. Below is a 'Mode' dropdown menu set to 'Internet Streaming'. The 'Provider' dropdown menu is set to 'Ustream'. There are input fields for 'Email/Username' and 'Password'.

Fig. 3-17

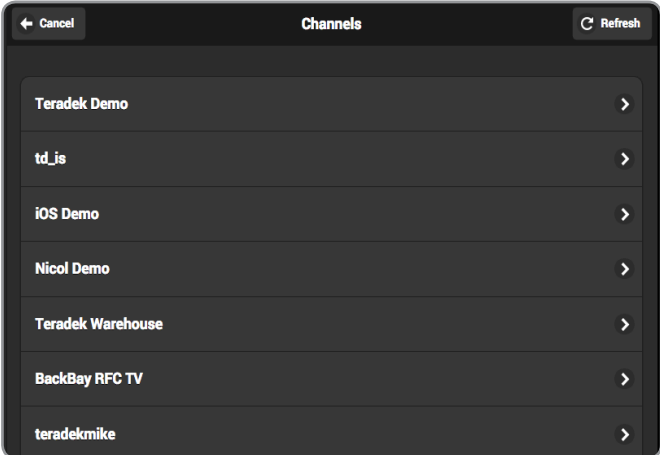
The image shows a mobile application screen titled 'Channels' with 'Cancel' and 'Refresh' buttons. It displays a list of channels with right-pointing chevrons: 'Teradek Demo', 'td_is', 'iOS Demo', 'Nicol Demo', 'Teradek Warehouse', 'BackBay RFC TV', and 'teradekmike'.

Fig. 3-18

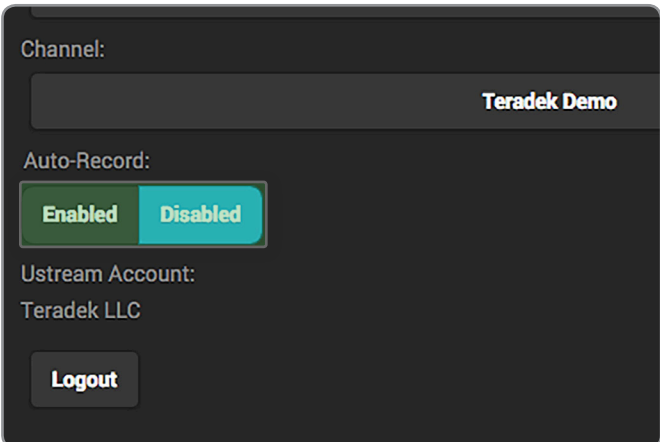
The image shows a mobile application screen for channel settings. It has a 'Channel:' label and a dropdown menu showing 'Teradek Demo'. Below is an 'Auto-Record:' section with two buttons: 'Enabled' (green) and 'Disabled' (teal). The 'Ustream Account:' is listed as 'Teradek LLC', and there is a 'Logout' button at the bottom.

Fig. 3-19

YouTube Live:

1. Select **YouTube Live**, then click **Authorize Your Device** (Fig. 3-20).
2. Copy the authentication code generated for your device, go to <http://www.google.com/device>, then enter your credentials (Fig. 3-21). Enter the code, then allow Cube to access your account.
3. Select an event, create a new event, or select "Stream Now".

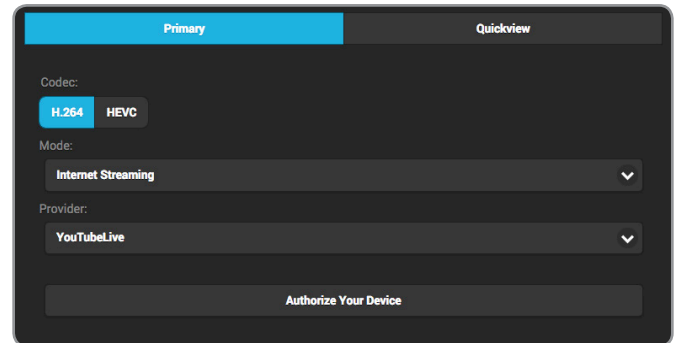


Fig. 3-20

Two types of Broadcast destinations

- a. The 'Stream Now' destination is a continuously accessible public channel with a permanent URL. Streaming to the 'Stream Now' page is as simple as start and stop.
- b. 'Event' destinations can be created, scheduled, started, and stopped. Every event comes with its own page URL, and once an event is finished it cannot be started again. After finishing an event, it is saved on its own page. Selecting an Event destination allows you to preview your broadcast.

4. After selecting a destination, begin your broadcast by selecting **Go Live**. If you selected an Event, you will have the option to **Preview** your broadcast (Fig. 3-22).
5. When ending the broadcast, select either **Stop** or **Complete Event** (Fig. 3-23).

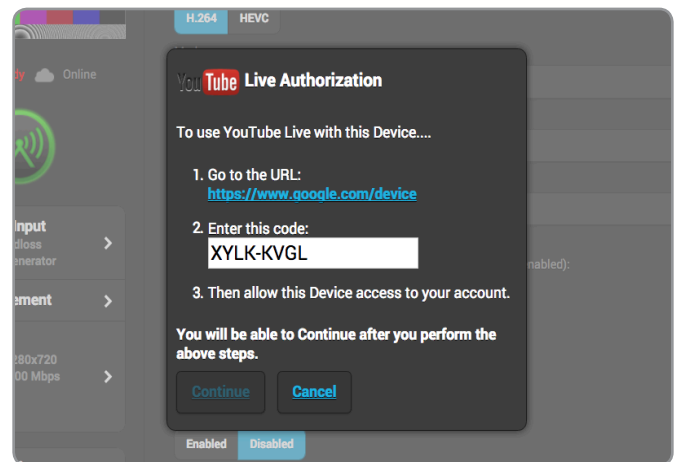


Fig. 3-21

Four key stages in the life cycle of a broadcast

To **start** Broadcast:

Preview - Preview the video you intend to broadcast. Videos in preview state are visible on the event's Live Control Room page.

Go Live - Makes your event visible on its own channel page. An event can not return to preview once it has gone live.

To **stop** Broadcast:

Stopped - Broadcasts can be stopped and restarted at any time while the event is in the preview or Live state.

Complete Event - You will no longer be able to broadcast to the event, but it will be saved on the event page for viewing.

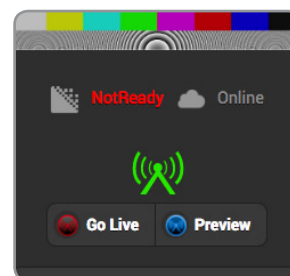


Fig. 3-22

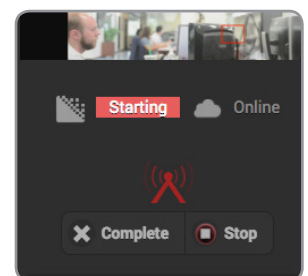


Fig. 3-23

Twitch:

1. Select **Twitch**, enter your credentials (Fig. 3-24), then select **Apply** on the upper-right corner.
2. To begin live streaming, tap the **Broadcast** button.

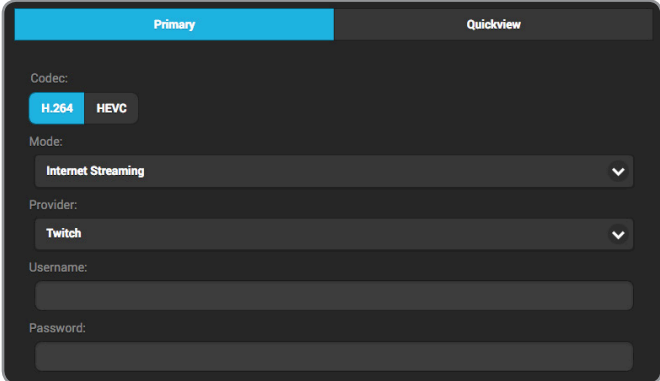
The screenshot shows the 'Primary' tab of a configuration interface. At the top, there are two tabs: 'Primary' (active) and 'Quickview'. Below the tabs, the 'Codec' section has two buttons: 'H.264' (selected) and 'HEVC'. The 'Mode' section has a dropdown menu with 'Internet Streaming' selected. The 'Provider' section has a dropdown menu with 'Twitch' selected. Below these are two text input fields for 'Username' and 'Password'. At the top right, there is an 'Apply' button.

Fig. 3-24

Wowza:

1. Select **Wowza**.

Server Mode (Fig. 3-25):

- a) Enter the host server URL and stream name provided by the streaming service.
- b) Enter your credentials, select **Apply**, then return to the **Home** screen.

Cloud Mode (Fig. 3-26):

- a) Enter the connection code
- b) Enter your credentials, select **Apply**, then return to the **Home** screen.

2. Tap the **Broadcast** button to go live.

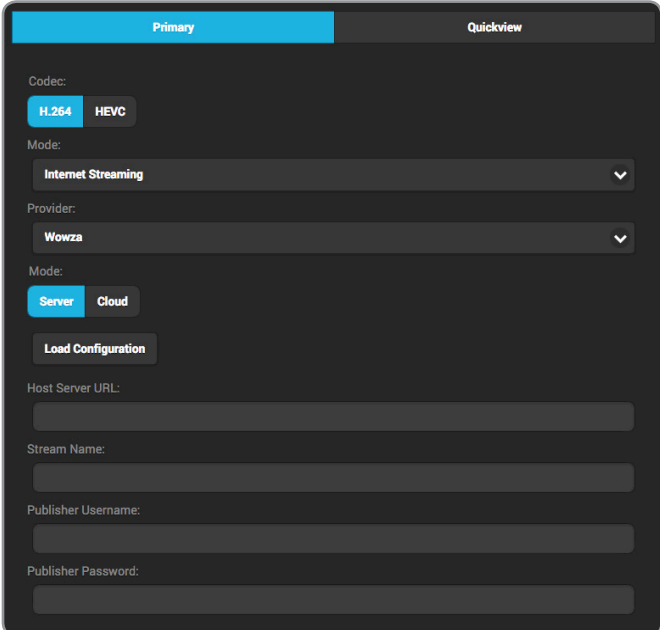
The screenshot shows the 'Primary' tab of a configuration interface. At the top, there are two tabs: 'Primary' (active) and 'Quickview'. Below the tabs, the 'Codec' section has two buttons: 'H.264' (selected) and 'HEVC'. The 'Mode' section has a dropdown menu with 'Internet Streaming' selected. The 'Provider' section has a dropdown menu with 'Wowza' selected. Below these are two text input fields for 'Host Server URL' and 'Stream Name'. The 'Publisher Username' and 'Publisher Password' sections each have a text input field. At the top right, there is an 'Apply' button. Below the 'Host Server URL' field, there is a 'Load Configuration' button.

Fig. 3-25

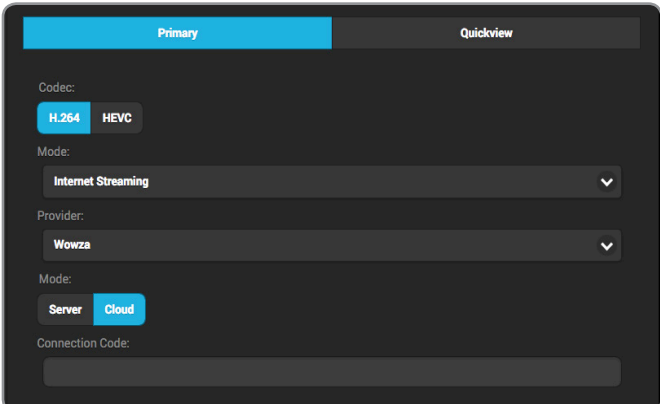
The screenshot shows the 'Primary' tab of a configuration interface. At the top, there are two tabs: 'Primary' (active) and 'Quickview'. Below the tabs, the 'Codec' section has two buttons: 'H.264' (selected) and 'HEVC'. The 'Mode' section has a dropdown menu with 'Internet Streaming' selected. The 'Provider' section has a dropdown menu with 'Wowza' selected. Below these are two text input fields for 'Connection Code' and 'Publisher Password'. At the top right, there is an 'Apply' button. Below the 'Connection Code' field, there is a 'Load Configuration' button.

Fig. 3-26

Facebook:

1. Select **Facebook**, then click **Authorize Your Device** (Fig. 3-27).
2. Copy the authentication code generated for your device, go to <https://www.facebook.com/device>, then enter your credentials (Fig. 3-28).
3. Enter the authentication code, then allow Cube to access your account.
4. Select whether to stream to your timeline or to a specific page, group, or event (Fig. 3-29), then click **Apply** on the upper left corner.

Streaming Destinations

Timeline – Broadcast the video to your personal timeline or “wall.”

Page – Broadcast the video to a page you manage.

Group – Broadcast the video to a group you manage.

Event – Broadcast the video to an event you created.

Scheduled Broadcasts

You can schedule a broadcast to post at a specific date and time. After creating a post on the page’s timeline, click the  next to **Publish**, select **Schedule**, then enter the date and time you want your post to be broadcast.

Privacy Settings

- Your Timeline privacy setting will be used if a less restrictive privacy option is chosen. (e.g. your timeline is set to Friends, but you set Cube to ‘All.’ The post will be visible to friends).
- Posts to Facebook pages are always public.

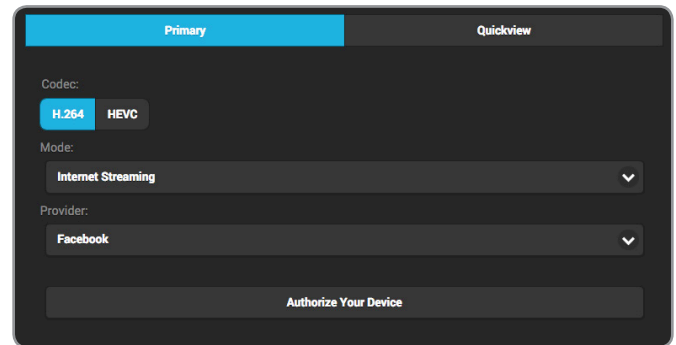


Fig. 3-27

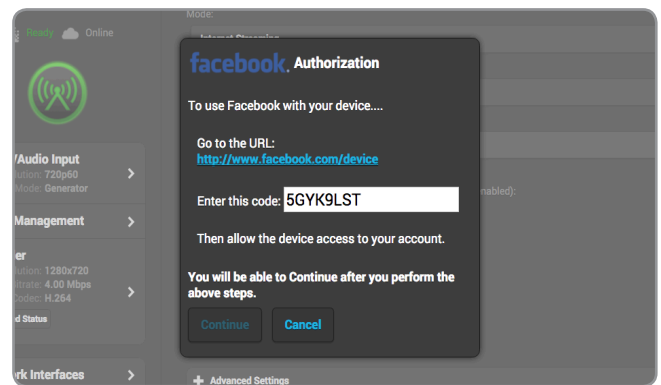


Fig. 3-28

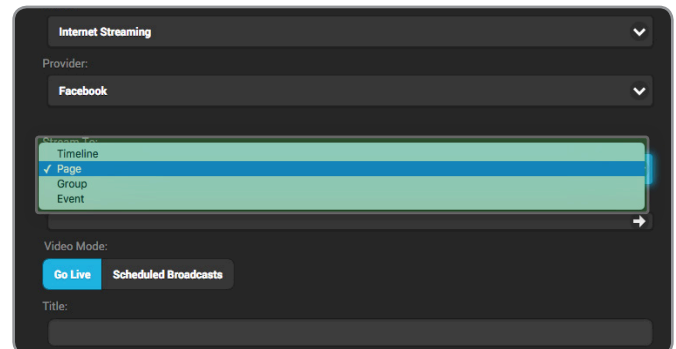


Fig. 3-29

4. Tap the **Broadcast** button to go live (Fig. 3-30).

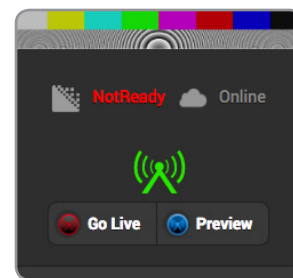


Fig. 3-30

Periscope:

1. Select **Periscope**, then click **Authorize Your Device** (Fig. 3-31).
2. Copy the authentication code generated for your device, go to <https://www.periscope.tv/auth>, then enter your credentials (Fig. 3-32).
3. Enter the authentication code, then allow Cube to access your account.

Persicope and Twitter

Periscope works in conjunction with Twitter. In order to use Persicope, you must create an account with your Twitter credentials, or by using your mobile phone number.

4. To post a link to your live stream on Twitter, enable the **Tweet Broadcast** feature.
5. Tap the **Broadcast** button to begin streaming (Fig. 3-33).

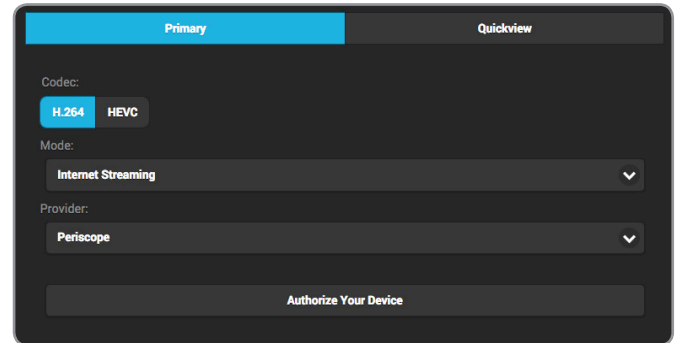


Fig. 3-31

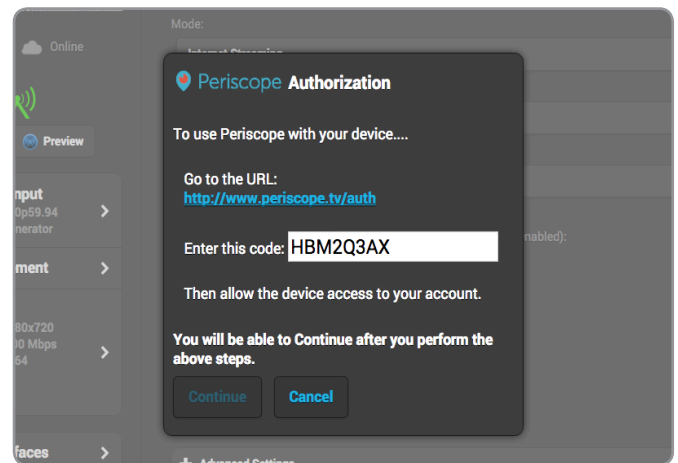


Fig. 3-32

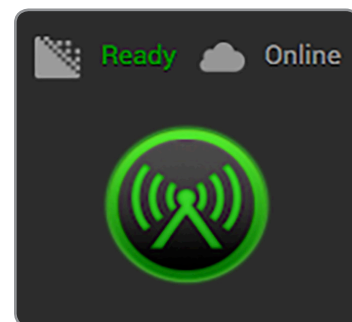


Fig. 3-33

RECORDING

Cube allows you to record your broadcasts directly to an attached USB, SD or micro SD card, or network file system (NFS). Each recording is saved with the same resolution and bit rate set on the device.

Enable/Disable Recording - Turns the recording feature on or off.

Media- Select a configured device location to store your recorded footage to.

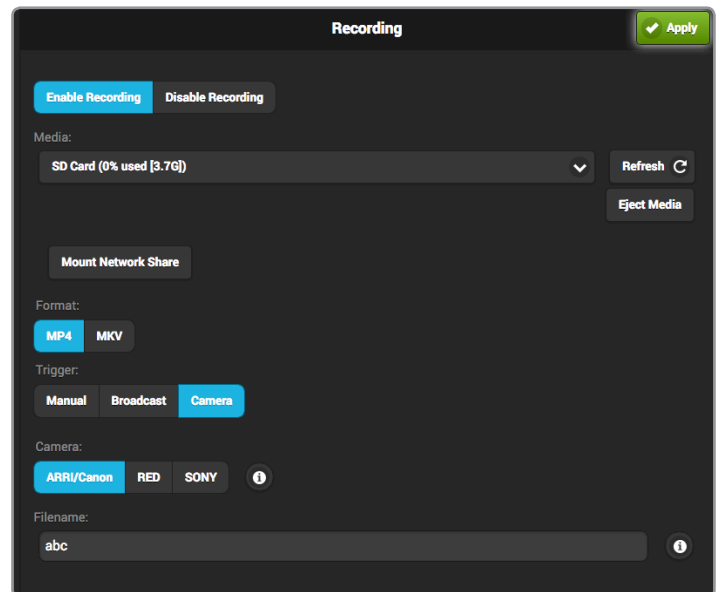
Mount Network Share - Configure an NFS location to store your recorded footage to.

Format - Select a format for your recording.

Trigger - Select how recording is initiated:

- **Manual** - Recording function is controlled manually from either the web UI or the Stream joystick on the device
- **Broadcast** - Recording function is triggered when you start the broadcast.
- **Camera (600 series encoders only)** - Cube will start recording the stream when a supported camera starts recording.

Filename - Select how the recording is identified.



To begin recording:

1. Insert a compatible SD card (Fig. 3-34) or USB drive into Cube, and enable recording.
2. Select the media you will be recording to.
3. Select a **Trigger**, or click **Start Recording** below the Broadcast button.

To configure and record to an NFS:

1. Select **Mount Network Share**.
2. Enter the host address and port, then click Mount.



Fig 3-34

Recording Considerations

- For best results, use Class 6 or higher SD cards.
- Media should be formatted using FAT32.
- Maximum size for each file is 4GB
- New recordings are automatically started after the file size limit is reached.

INTERRUPTIBLE FEEDBACK (IFB)

Interruptible feedback (IFB) provides two way audio communication between the encoder and the decoder, allowing the director or off-camera personnel to communicate with the camera operator.

Point-to-Point IFB Configuration

1. From both the encoder and decoder web UI, navigate to the **IFB** menu, then select **Enabled**.
2. Enter the encoder's IP address in the decoder's **Destination Host** field, and the decoder's IP address in the encoder's **Destination Host** field (Fig. 3-35).
3. Copy the encoder's destination and receiving port values and enter them in the opposite fields in the decoder's interface (Fig. 3-36).
4. Select UDP or TCP as the communication protocol (should be identical on both devices).
5. Select **Apply** on both devices.

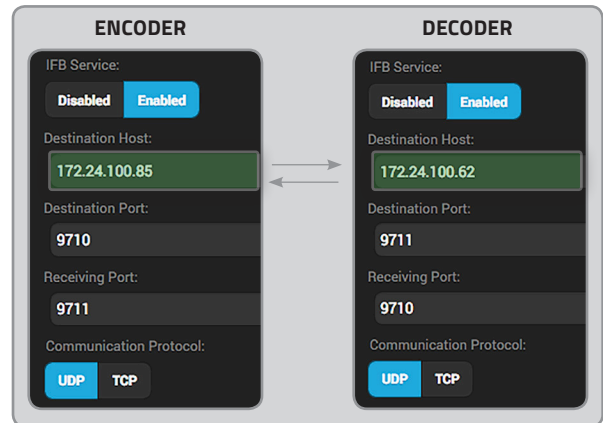


Fig. 3-35

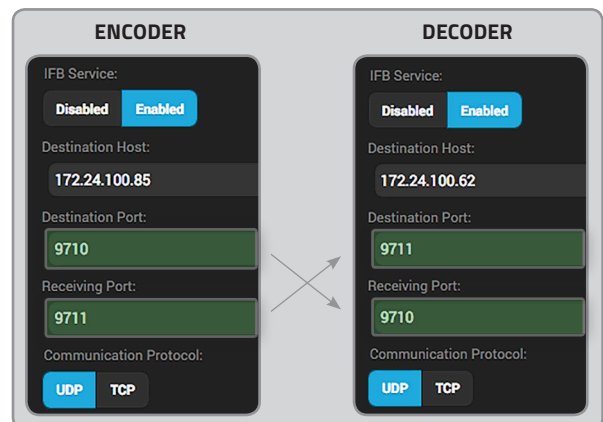


Fig. 3-36

IFB Configuration via Sputnik

1. From the encoder web UI, enter the **Cloud Services** menu, then select **Sputnik**.
2. Enter Sputnik's IP address and create a session password. Select **Apply**.
3. From the decoder web UI, enter the **Cloud Services** menu, select **Sputnik**, then enter the same Sputnik IP address as the encoder.
4. Enter the **Stream Source** menu, then select **Sputnik** as the streaming mode (Fig. 3-37). Enter the encoder's serial number and the session password created in the encoder web UI, then select **Apply**.
5. After enabling IFB on both the encoder and the decoder, the **IFB Buffer** knob will be displayed. If a poor connection causes audio quality issues, such as choppy audio or high latency, slide the knob to the right to increase the buffer (Fig. 3-38).

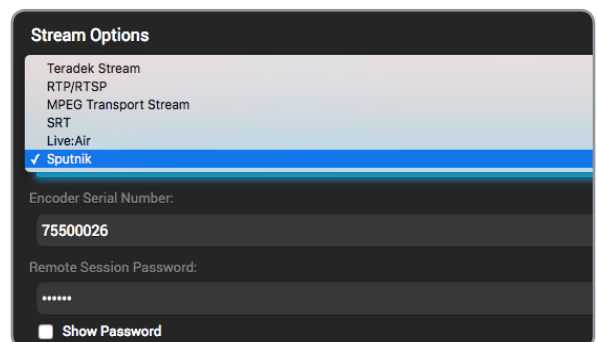


Fig. 3-37

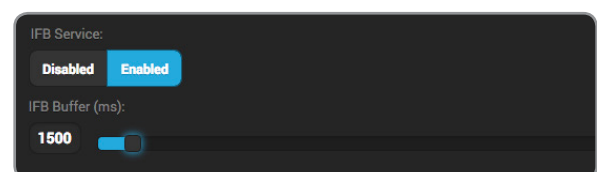


Fig. 3-38

SYSTEM

Essential system functions, including factory reset and firmware upgrade, can be performed from the **System** menu in the web UI (**System Setup** from the front panel interface).

Factory Reset

Access the **System** menu and select **Factory Reset** (Fig. 3-39). Restore Cube to its original settings by selecting an option (**All**, **Broadcast**, or **Network**) to reset.

Firmware Upgrade

Upgrade Cube's firmware to the latest version.

Perform a Firmware Upgrade from front panel

After turning on Cube, navigate to the System Setup menu to check for new firmware. If an update is available, simply follow the prompts to complete the firmware update.

Perform a Firmware Upgrade from web UI (Fig. 3-40)

- Download the latest firmware version from teradek.com.
- Select **Firmware Upgrade**.
- Upload the file from your computer and select **Upgrade**.

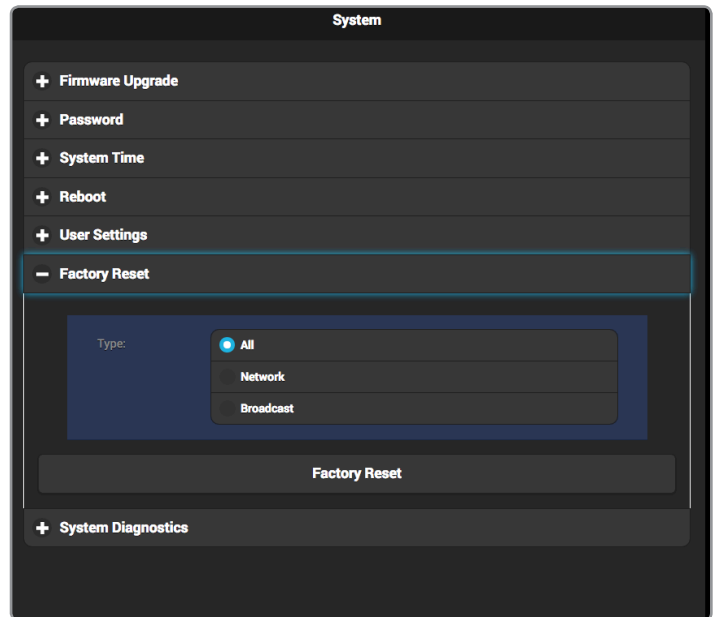


Fig. 3-39 Factory Reset

Password

To add, change, or delete your password, select **Password** from the system menu on the web UI, then follow the prompts.

System Time

Select **Manual** mode to manually input the time and date, or select **NTP** to automatically synchronize the time and date.

Reboot

Restart your Cube device by selecting **Reboot**, or simply turn Cube off and on again.

User Settings

Import or export a saved user setting configuration.

System Diagnostics

Generate a diagnostic report specific to your device. Diagnostic reports can be used by Teradek's support team to assist during troubleshooting.

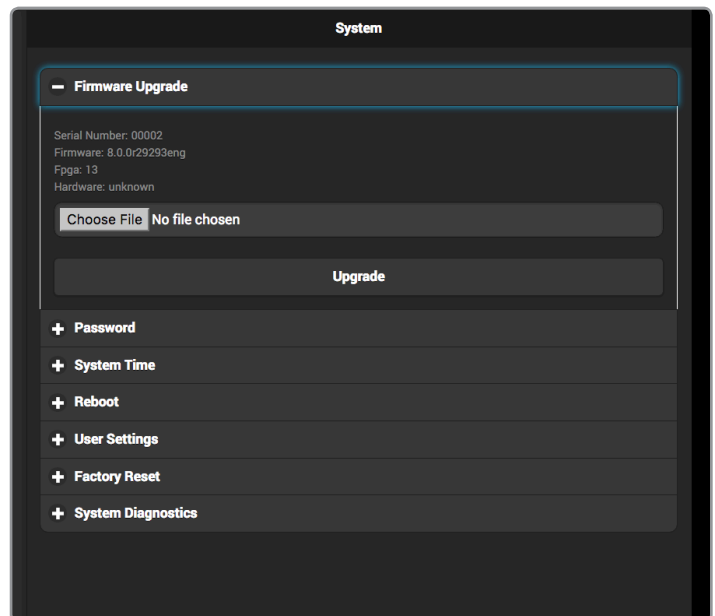


Fig. 3-40 Firmware Upgrade

LICENSES

Cube supports a variety of features that are activatable on a per-device basis. After purchasing a license, you will receive an email from Teradek containing the license key.

To add a License:

1. Copy the license key from the email, then paste it on to the **License Text** field (Fig. 3-41).
2. Click **Add Licenses**.
3. To activate the license, you will be prompted to reboot Cube. Navigate to the **System** menu and select **Reboot**.

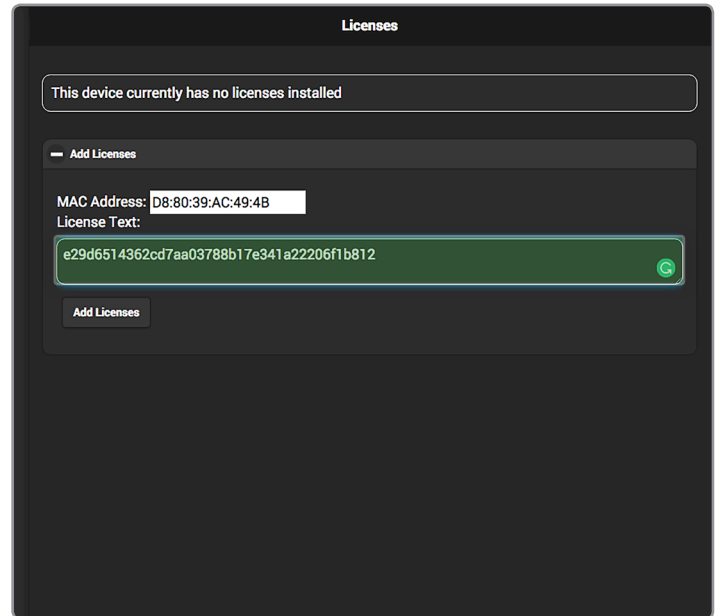
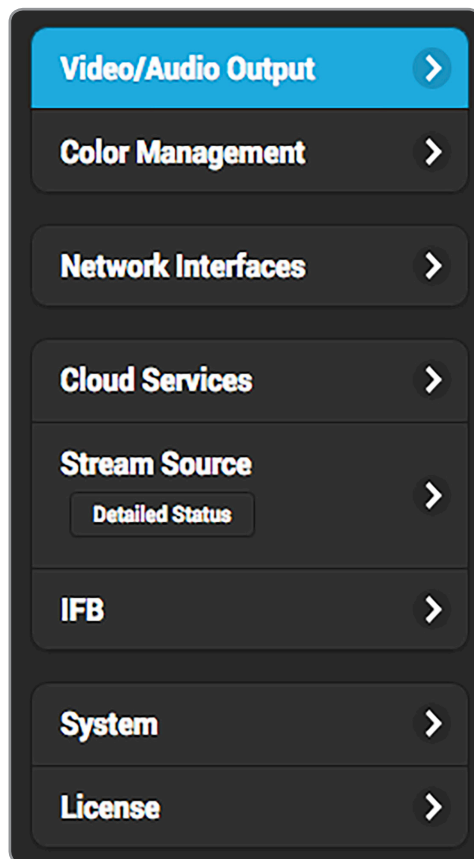


Fig. 3-41

DECODER CONFIGURATION

NAVIGATING THE SETTINGS MENU

The Decoder Settings menu allows you to customize and control Cube's audio/video output, and network settings. Use the web UI or the front panel interface to access the Decoder Settings menu. **NOTE:** This section illustrates the settings as they are available on the web UI. These settings can also be configured from Cube's front panel interface (see below).



VIDEO/AUDIO OUTPUT: Contains options for configuring your video/audio output and Test Pattern preferences.

COLOR MANAGEMENT: Select 3D LUT and CDL files stored on your computer to apply to your video output.

NETWORK INTERFACES: Contains options for configuring Ethernet, Wi-Fi, and USB modem interfaces.

CLOUD SERVICES: Enable Core, Teradek's cloud service management service.

STREAM SOURCE: Allows you to select and configure a streaming mode and its characteristics. Options include:

- Automatic*
- RTP/RTSP
- MPEG Transport Stream
- SRT
- Teradek Streaming
- RTP Push*
- Live:Air

IFB: Contains options for configuring two-way audio communication.

SYSTEM: Perform factory reset, firmware upgrade, system diagnostics, and other essential system functions.

LICENSE: Add, import, or export license files for additional functionality.

** 600 series encoders only*

FRONT PANEL INTERFACE SETTINGS

DECODER SETUP

DECODER SETUP: Configure the video stream source and streaming mode option.

OUTPUT SETUP

OUTPUT SETUP: Allows you to configure the video and audio output.

3D LUT SETUP

3D LUT SETUP: Apply specific looks stored on Cube to apply to the video output.

CLOUD SETUP

CLOUD SETUP: Enable Core, Teradek's cloud service management service.

NETWORK SETUP

NETWORK SETUP: Contains options for configuring Ethernet, Wi-Fi, and USB modem interfaces.

SYSTEM SETUP

SYSTEM SETUP: Perform factory reset, firmware upgrade, and configure your display and debug settings.

VIDEO/AUDIO OUTPUT

The Video/Audio Output menu contains several output source configuration and test pattern options.

Output Resolution

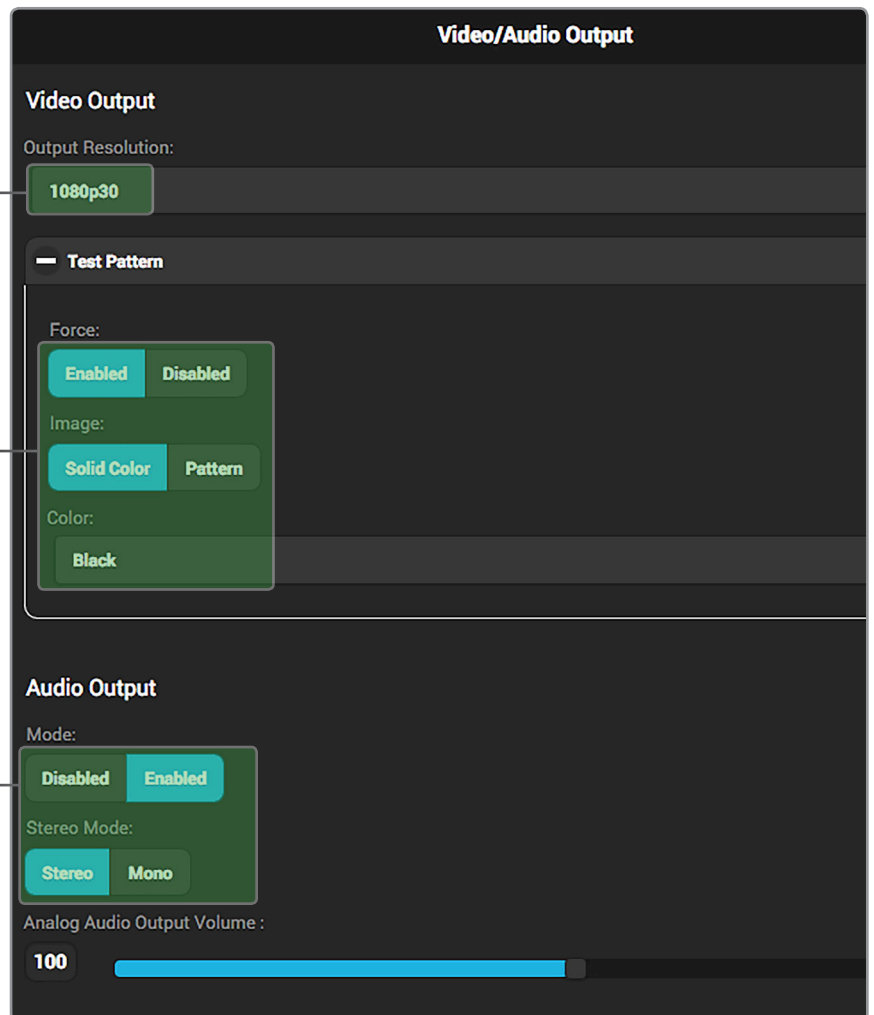
Use this option to configure the video output format. The output resolution can be set independently of the video stream resolution.

Test Pattern

The Test Pattern option allows you to output a test image when no video is connected. Setting Force to Enabled causes the decoder to output a test pattern (Fig. 4-1, Fig. 4-2), regardless of the video connection.

Audio Output

Configure the audio output. Audio can be enabled or disabled, and the output can be set to **Mono** or **Stereo**. When set to Mono, channel 1 (left) audio is output on channels 1 and 2 (left/right).



COLOR MANAGEMENT

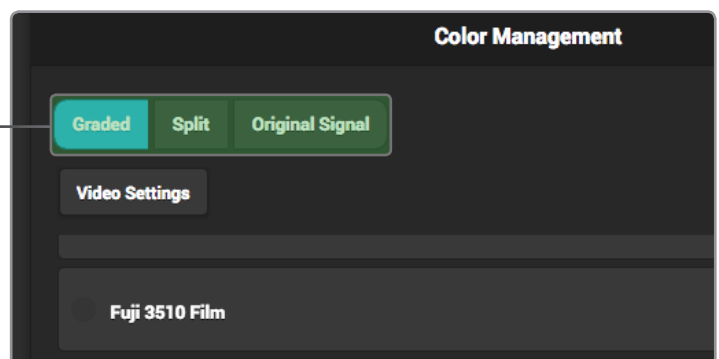
The Color Management menu contains options for adding specific looks from your computer and saving them to Cube's interface. These looks can either be 3D LUT files, CDL preset files, or files composed of both formats. Use this menu or the front panel interface to apply presets to the video output. Up to 32 looks can be stored on the device.

Color Management options

Graded - Enable a look preset.

Split - Display a split screen view of the original image and any selected preset.

Original Signal - Transmit the input source's original look without a look preset.



COLOR MANAGEMENT (CONT.)

Creating a Look:

Look presets can be created from a 3D LUT and either an ASC CDL file or 1D LUT + Saturation files.

1. Select **Add a new Look**.
2. Enter a name for your look under the name field. If a name is not entered, the look will use the same name as the 3D LUT filename. Names can be up to 32 characters long.
3. Select whether you would like to load a CDL file (Fig. 4-3), or a 1D LUT file + Saturation file, then click **Choose File** to select the file(s) from your computer.
4. Select **Choose File** under the 3D LUT section and pick the 3D LUT file you wish to use.

Organizing look presets (Fig. 3-4)

Arrange look presets either by dragging the desired preset up and down on the list or clicking the  or  icons.

Deleting looks

Look presets can be deleted by clicking the **X** button located in the look's listing.

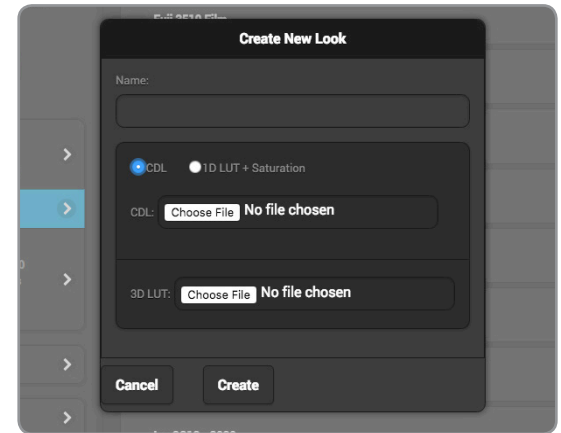


Fig. 4-3

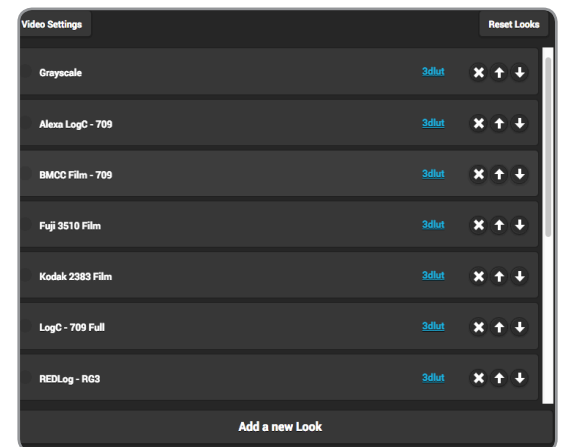


Fig. 4-4

NETWORK INTERFACES

Cube allows you to connect and stream to the Internet by utilizing one of several network interfaces.

Wired

A wired Ethernet connection is typically the most reliable means for connecting to a network, as you don't have to deal with the instability of a Wi-Fi or cellular connection. To configure the Ethernet interface, select Wired from the Network Interfaces page, then click Modify (Fig. 4-5).

IP Address Modes

Dynamic (DHCP) - The connected router generates an IP address, allowing Cube to be automatically configured.

Static - Manually configure the IP address settings if a DHCP server is not available, or if applications require fixed address.

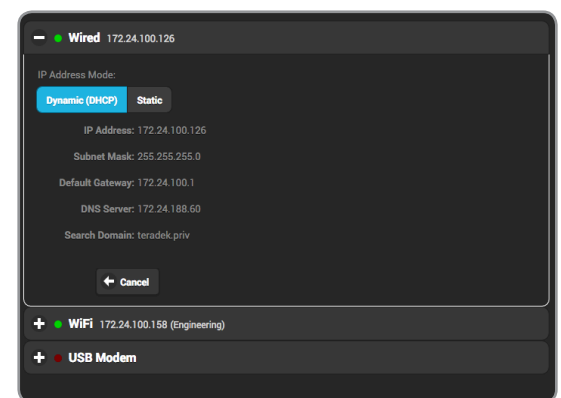


Fig. 4-5

Wireless (Wi-Fi)

Although an Ethernet connection is the most reliable method of connecting to a network, a Wi-Fi connection may be more convenient, especially if an Ethernet connection is unavailable. There are two Wi-Fi modes available (Fig. 4-6); **Access Point (AP) Mode** and **Client (Infrastructure) Mode**.

Wi-Fi Modes

Access Point (AP) Mode - Cube acts as its own dual band access point, allowing you to connect your device directly to Cube's AP network.

Client (Infrastructure) Mode - Cube and your device connect to the same local wireless network. Access Client Mode, then click **Browse** to scan for available networks (Fig. 4-7), or **Saved Networks** to connect to a previously saved network, then enter your credentials.

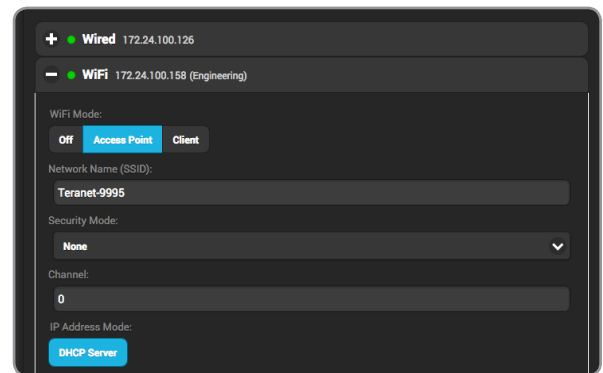


Fig. 4-6



Fig. 4-7

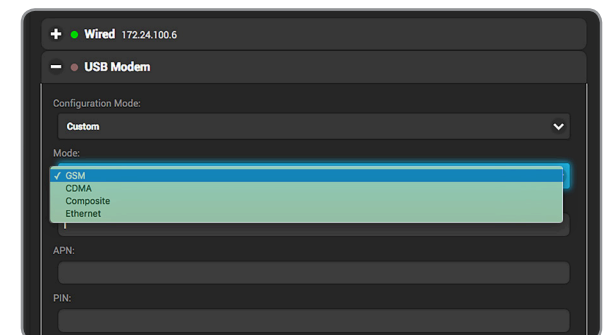


Fig. 4-9

USB Modem

A USB modem allows you to broadcast wherever a cell connection is available. Cube automatically detects and supports many modems using the Auto setting. If you need to configure a modem, connect to Cube using AP mode (see page 17), and insert the USB Modem into Cube (Fig. 4-8). From the **Network Interfaces** page, select **USB Modem**, then select a configuration mode.

Configuration Modes (Fig. 4-9)

Auto (default): The modem is automatically detected and configured.

Custom: Allows you to manually configure a modem if it's not automatically detected. Available configuration modes are **GSM**, **CDMA**, **Composite**, and **Ethernet**. Modes will vary based on the modem model and mobile network provider.

STREAM SOURCE

Select from a variety of different stream types to match your input source from the drop-down menu, or select an available stream to decode.

TERADEK STREAMING (TDS)

TDS is specifically optimized for local streaming with minimum latency between Teradek devices. Configure TDS by selecting a protocol (UDP or Multicast) and entering the destination port of the Teradek encoder. Enter the IP address if streaming in Multicast.

RTP/RTSP

When RTP/RTSP mode is enabled, the decoder communicates whether to use the TCP or UDP protocol for the stream. Ensure you have the correct port and stream name (*stream 1* is the default). To view your stream on VLC, copy the IP address from the Host field, launch VLC and open **File>Open Network**. Paste the IP address in the URL field, then click **Open**.

RTP PUSH

RTP Push streaming allows you to direct video to a server or client and generate an SDP file containing the stream description. SDP files can be stored on a streaming server, or opened by video players like VLC. The RTP Push license is provided by request, free of charge.

MPEG TRANSPORT STREAM (MPEG-TS)

To stream over MPEG Transport Stream, you'll first need to purchase the license from Teradek. In MPEG Transport Stream Mode, Cube sends video via a TCP or UDP protocol to a specified unicast or multicast address. TCP is recommended when streaming over the Internet, while UDP is recommended when streaming over a local network to avoid the additional network overhead of TCP. Select the protocol best suited for your application needs, and ensure the Cube encoder is configured to stream to the Cube decoder's corresponding IP address and port.

CONFIGURABLE SETTINGS

- Protocol
 - Port
 - Advanced Settings
 - *Caching*
 - *Audio Sample Rate*
-

- Host
 - Port
 - Stream name
 - Username
 - Password
 - Client Port
 - Advanced Settings
 - *Caching*
 - *Audio Sample Rate*
-

- Video Port
 - Audio Port
 - Advanced Settings
 - *Caching*
 - *Audio Sample Rate*
-

- Protocol
- Host
- Port
- Jitter Buffering
- Audio Codec
- Advanced Settings
 - *Caching*
 - *Audio Sample Rate*

SRT

SRT is used to transmit high quality, low-latency video over unreliable networks. SRT has two connection types: **Caller** or **Listener**. Caller pulls the stream from the encoder, while Listener waits for the encoder to initiate the connection. For either mode, a port number and passphrase (if one is set) is needed.

LIVE:AIR

Live:Air Action is a video production suite that can receive feeds from any Cube encoder for real-time video mixing, switching and even transitions. Once you've configured Cube to stream in Live:Air mode, you can manage it from the Live:Air Action (see page 7) or VUER apps (see page 8).

AUTOMATIC

Automatic allows you to select a device to decode from.

CONFIGURABLE SETTINGS

- Connection type
- Port
- Encryption
- Latency
- Advanced Settings
 - *Caching*
 - *Audio Sample Rate*

-
- Host
 - Port
 - Advanced Settings
 - *Caching*
 - *Audio Sample Rate*

-
- Choose a Stream
 - Advanced Settings
 - *Caching*
 - *Audio Sample Rate*

INTERRUPTIBLE FEEDBACK (IFB)

Interruptible feedback (IFB) provides two way audio communication between the encoder and the decoder, allowing the director or off-camera personnel to communicate with the camera operator.

Point-to-Point IFB Configuration

1. From both the encoder and decoder web UI, navigate to the **IFB** menu, then select **Enabled**.
2. Enter the encoder's IP address in the decoder's **Destination Host** field, and the decoder's IP address in the encoder's **Destination Host** field (Fig. 4-10).
3. Copy the encoder's destination and receiving port values and enter them in the opposite fields in the decoder's interface (Fig. 4-11).
4. Select UDP or TCP as the communication protocol (should be identical on both devices).
5. Select **Apply** on both devices.

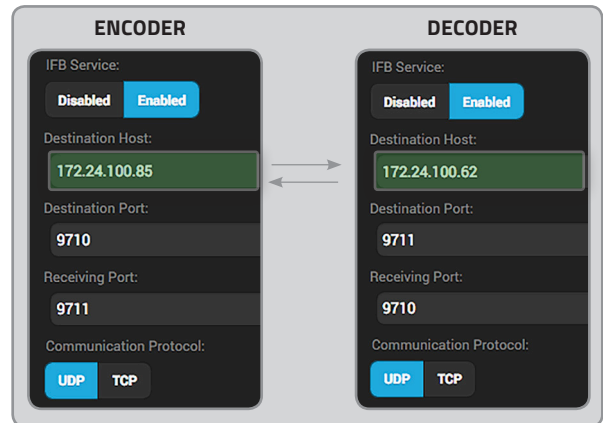


Fig. 4-10

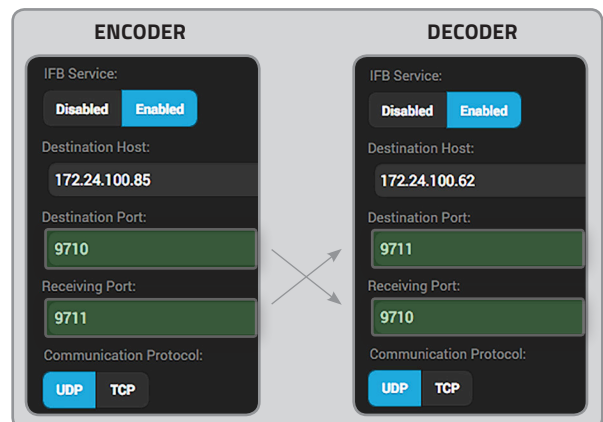


Fig. 4-11

IFB Configuration via Sputnik

1. From the encoder web UI, enter the **Cloud Services** menu, then select **Sputnik**.
2. Enter Sputnik's IP address and create a session password. Select **Apply**.
3. From the decoder web UI, enter the **Cloud Services** menu, select **Sputnik**, then enter the same Sputnik IP address as the encoder.
4. Enter the **Stream Source** menu, then select **Sputnik** as the streaming mode (Fig. 4-12). Enter the encoder's serial number and the session password created in the encoder web UI, then select **Apply**.
5. After enabling **IFB** on both the encoder and the decoder, the **IFB Buffer** knob will be displayed. If a poor connection causes audio quality issues, such as choppy audio or high latency, slide the knob to the right to increase the buffer (Fig. 4-13).

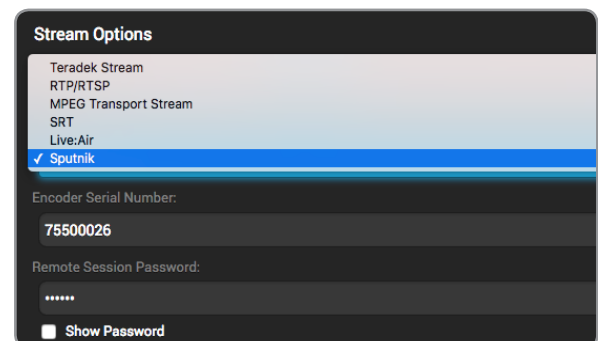


Fig. 4-12

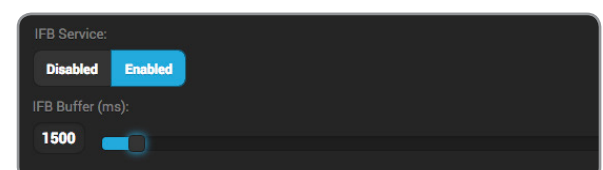


Fig. 4-13

SYSTEM

Essential system functions, including factory reset and firmware upgrade, can be performed from the **System** menu in the web UI (**System Setup** from the front panel interface).

Factory Reset

Access the **System** menu and select **Factory Reset** (Fig. 4-14). Restore Cube to its original settings by selecting an option (**All, Broadcast, or Network**) to reset.

Firmware Upgrade

Upgrade Cube's firmware to the latest version.

Perform a Firmware Upgrade from front panel

When you turn on Cube, the device will automatically check for new firmware. If an update is available, follow the prompts to complete the update.

Perform a Firmware Upgrade from web UI (Fig. 4-15)

- Download the latest firmware version from teradek.com.
- Select **Firmware Upgrade**.
- Upload the file from your computer and select **Upgrade**.

Password

To add, change, or delete your password, select **Password** from the system menu on the web UI, then follow the prompts.

System Time

Select **Manual** mode to manually input the time and date, or select **NTP** to automatically synchronize the time and date.

Reboot

Restart your Cube device by selecting **Reboot**, or simply turn Cube off and on again.

User Settings

Import or export a saved user setting configuration.

System Diagnostics

Generate a diagnostic report specific to your device. Diagnostic reports can be used by Teradek's support team to assist during troubleshooting.

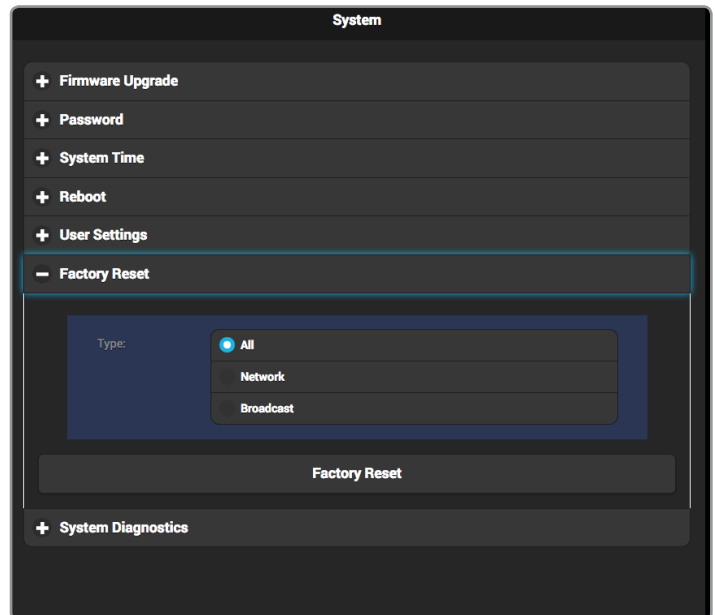


Fig 4-14 Factory Reset

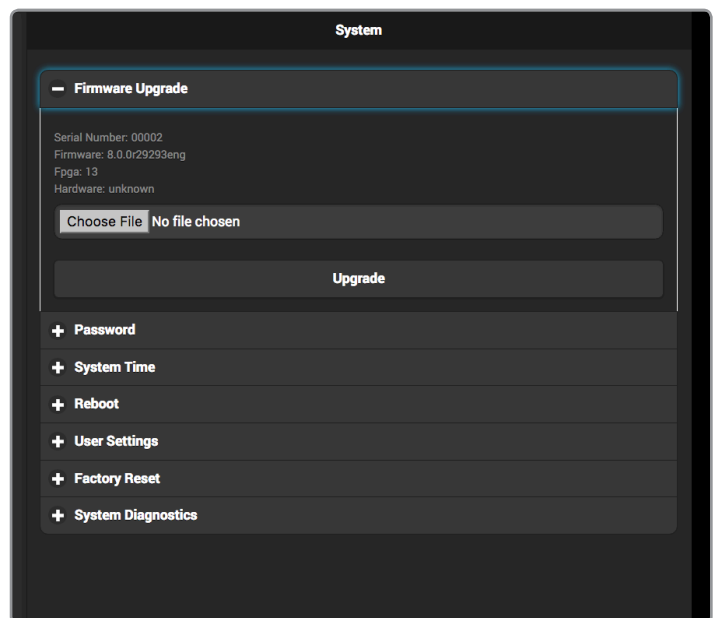


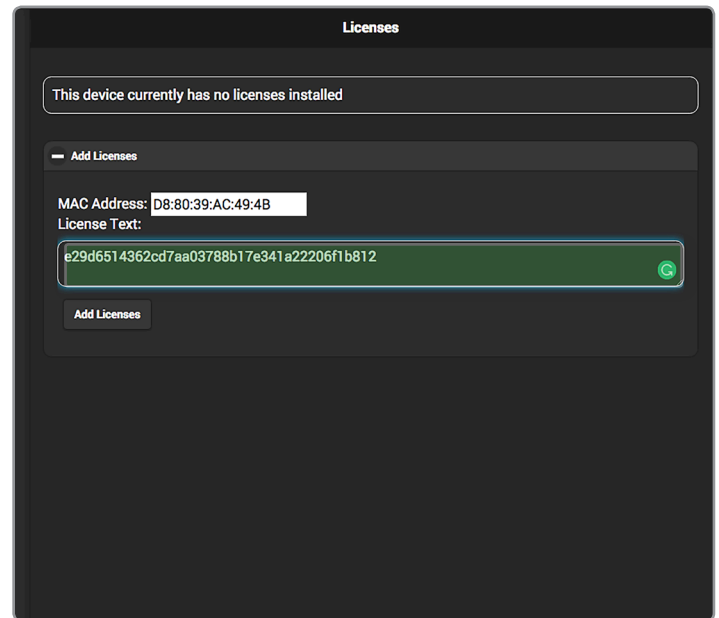
Fig 4-15 Firmware Upgrade

LICENSES

Cube supports a variety of features that are activatable on a per-device basis. After purchasing a license, you will receive an email from Teradek containing the license key.

To add a License:

1. Copy the license key from the email, then paste it on to the **License Text** field (Fig. 4-16).
2. Click **Add Licenses**.
3. To activate the license, you must reboot Cube. Navigate to the **System** menu and select **Reboot**.



The screenshot shows a dark-themed interface titled "Licenses". At the top, a message states "This device currently has no licenses installed". Below this is a section titled "Add Licenses" which contains two input fields. The first field is labeled "MAC Address:" and contains the text "D8:80:39:AC:49:4B". The second field is labeled "License Text:" and contains a long alphanumeric string "e29d6514362cd7aa03788b17e341a22206f1b812". A green checkmark icon is visible to the right of the License Text field. At the bottom of the "Add Licenses" section is a button labeled "Add Licenses".

Fig 4-16

TROUBLESHOOTING

POWER/CONNECTION ISSUES

Cube will not power on.

Power cable may not be connected properly, or the external battery may be discharged. Check the battery's charge. If the battery is charged, remove the video cable and verify that the power cable or battery plates are connected and the cables are not damaged.

Video Input LED stays off, but a video cable is connected.

No video input is detected. Verify that your video source is connected to Cube. Check cables for damage. Check that the camera's video output is enabled, and the output format is compatible with Cube

AUDIO/VIDEO STREAMING

Cannot open or view my video stream.

Cube may not be encoding, or the stream URL may be incorrect. Verify that Cube is encoding (Codec Status LED is illuminated).

Video stream keeps breaking up/freezing.

Bitrate/resolution may be set too high for the network's available bandwidth. From the **Encoder** menu, lower the bit rate and/or resolution to avoid lost/late video data. For 600 series Cubes, manually adjusting the **Rate Control** settings (see page 14) provides more control over the streaming bandwidth, and may improve performance in challenging or restricted network environments.

VLC video latency is more than a second.

By default, VLC's buffer is set to 1.2 seconds. Decreasing the buffer size will reduce the latency.

Video to iPad is delayed by more than 10 seconds.

HTTP Live mode is enabled. For low latency streaming to iOS devices, download any of Teradek's video streaming iOS apps (Live:Air Action, TeraView, or VUER), then switch to Quickview stream.

NETWORK/WEB UI

My video stream does not have audio.

Either audio is disabled, or Quickview stream is being used. Enable audio (embedded or analog) on the Video/Audio Input menu.

Cannot connect to Cube in Access Point (AP) mode.

The network settings may be incorrect.

- (a) Verify you are connected to Cube's AP network (see page 8). Make sure Cube's Wi-Fi indicator is displayed.
- (b) Verify your computer is set to DHCP or has an IP address in the 172.16.x.x

Cannot connect to Cube in Infrastructure (Client) mode.

Cube may be disconnected from the network, or the network settings may be incorrect. From the front panel interface, navigate to **Network Setup > WiFi**, then select **[Status]** to view the WiFi status menu (see page 6). If you still cannot configure your WiFi connection, connect an Ethernet cable to Cube, access the web UI, and verify that infrastructure SSID, password, and security type are correct.

Cannot log in to web UI.

Below is the default login information for Cube's web UI:

Login: admin

Password: admin

If the password has been changed, perform a full factory reset (see page 28).

INTERNET STREAMING

Cannot verify login.

You may have entered incorrect account information, or have no Internet connection. Verify your account credentials are correct. If they are correct, verify that your network has an Internet connection. Also, verify Cube's **Network Interfaces** menu has valid gateway and name server values.

Cannot start broadcast.

Cube may not have an Internet connection, or the Cube encoder may not be started. Verify Cube has an Internet connection, and/or verify that the ENC LED is illuminated a solid green.

Broadcast has started, channel shows "LIVE," but only a black screen is shown.

This indicates the bit rate may be set too high for the network's available bandwidth. From the **Encoder** menu, lower the bit rate and/or resolution to avoid lost/late video data.

TECHNICAL SPECIFICATIONS

CUBE ENCODER

	600 SERIES	700 SERIES
VIDEO		
Video Inputs	HDMI 1.4a: Full Size SD/HD/3G-SDI (75 Ω BNC)	HDMI 1.4a: Full Size SD/HD/3G-SDI (75 Ω BNC)
Supported Resolution	1080p 23.98/24/25/29.97/30/50/59.94/60 1080i 50/59.94/60 1080PsF 23/24/25/29/30 720p 50/59.94/60 576i 480i 480p (for HDMI input only) 576p (for HDMI input only)	1080p 23.98/24/25/29.97/30/50/59.94/60 1080i 50/59.94/60 1080PsF 23/24/25/29/30 720p 50/59.94/60 576i 480i 480p (for HDMI input only) 576p (for HDMI input only)
VIDEO PROCESSING		
Video Compression	H.264, baseline, main and high profile	H.265, H.264, baseline, main and high profile
Supported Video Bitrate	250 Kbps to 15 Mbps (Wired:15 Mbps, WiFi:10 Mbps)	250 Kbps to 30 Mbps
Test Pattern Generator Support	Yes	Yes
Video Format Conversion Support	Built-in video scaler and deinterlacer	Built-in video scaler and deinterlacer
Color Correction	CDL/1024 1D LUT (supports 10-bit color), 33x33x33 3D LUT (supports 10-bit color)	CDL/1024 1D LUT (supports 10-bit color), 33x33x33 3D LUT (supports 10-bit color)
PROTOCOL SUPPORT		
Network Protocols	TCP/IP, UDP, HTTP, DHCP, NTP, SSL, IGMP	TCP/IP, UDP, HTTP, DHCP, NTP, SSL, IGMP
Supported Video Transport Protocols	RTMP, RTP, RTSP, RTSP over HTTP, MPEG-TS (MPEG-TS is an optional paid license)	RTMP, RTP, RTSP, RTSP over HTTP, MPEG-TS (MPEG-TS is an optional paid license)
Bonding	Ethernet, Wi-Fi, USB Modem, TeraLink, accepts Teradek Bond 4-port cellular bonding device	Ethernet, Wi-Fi, USB Modem, TeraLink, accepts Teradek Bond 4-port cellular bonding device
Remote	Teradek Core	Teradek Core
Platform Integration	UStream, YouTube Live, Facebook, Livestream, Twitch, Periscope	UStream, YouTube Live, Facebook, Livestream, Twitch, Periscope
AUDIO		
Audio Compression	AAC-LC, MPEG Layer 2	AAC-LC, MPEG Layer 2
Audio Input	Embedded audio input, analog line or mic in, adjustable gain	Embedded audio input, analog line or mic in, adjustable gain
Audio Output	Headphone output	Headphone output

	600 SERIES	700 SERIES
PHYSICAL		
Dimensions	4.75"W x 3"D x 1.1"H [120.7 x 76.2 x 27.9mm]	4.75"W x 3"D x 1.1"H [120.7 x 76.2 x 27.9mm]
Weight	11.6oz (328.9g)	11.6oz (328.9g)
Construction	Milled Aluminum	Milled Aluminum
INTERFACES		
Configuration Interfaces	OLED Display with joystick navigation buttons	OLED Display with joystick navigation buttons
Switches	On/Off and reset switch	On/Off and reset switch
Recording/Storage	SD Card: Full size	SD Card: Full size
Desktop App	Feature-rich web UI for configuration and control	Feature-rich web UI for configuration and control
Mobile App	VUER, Live:Air Action	VUER, Live:Air Action
USB Interface Functionality	Powered USB 2.0 host port	Powered USB 2.0 host port
NETWORK		
Ethernet	10/100/1000 BASE-T Gigabit	10/100/1000 BASE-T Gigabit
Wireless	Cube 655 only - 2.4/5GHz 802.11 ac/a/b/g/n MiMo	Cube 755 only - 2.4/5GHz 802.11 ac/a/b/g/n MiMo
USB	USB 3G/4G Modem support	USB 3G/4G Modem support
RF Channel	Cube 655 only - Auto with 3 modes: (2.4 or 5 Ghz), Auto (2.4 GHz only), Auto (5 Ghz only), Configurable to specific channels	Auto with 3 modes: (2.4 or 5 Ghz), Auto (2.4 GHz only), Auto (5 Ghz only), Configurable to specific channels
Encryption	Cube 655 only - 802.1x, 802.11i, WPA2, WPA and WEP 64/128 TKIP, 128bit AES	802.1x, 802.11i, WPA2, WPA and WEP 64/128 TKIP, 128bit AES
POWER		
Power Input	2 pin circular-locking connector	2 pin circular-locking connector
Nominal Power Consumption	7W (no WiFi)	8W, 7W (no WiFi)
Auxiliary Power Input	6-28V DC	6-28V DC

CUBE DECODER

	600 SERIES	700 SERIES
VIDEO		
Video Outputs	HDMI 1.4a: Full Size SD/HD/3G-SDI (75 Ω BNC)	HDMI 1.4a: Full Size SD/HD/3G-SDI (75 Ω BNC)
Supported Resolution	1080p 23.98/24/25/29.97/30/50/59.94/60 1080i 50/59.94/60 1080PsF 23/24/25/29/30 720p 50/59.94/60 576i 480i 480p (for HDMI output only) 576p (for HDMI output only)	1080p 23.98/24/25/29.97/30/50/59.94/60 1080i 50/59.94/60 1080PsF 23/24/25/29/30 720p 50/59.94/60 576i 480i 480p (for HDMI output only) 576p (for HDMI output only)
VIDEO PROCESSING		
Video Decompression	H.264, baseline, main and high profile	H.265, H.264, baseline, main and high profile
Supported Video Bitrate	250 Kbps to 15 Mbps (Wired:15 Mbps, WiFi:10 Mbps)	250 Kbps to 30 Mbps
Test Pattern Generator Support	Yes	Yes
Video Format Conversion Support	Built-in video scaler and deinterlacer	Built-in video scaler and deinterlacer
PROTOCOL SUPPORT		
Network Protocols	TCP/IP, UDP, HTTP, DHCP, NTP, SSL, IGMP	TCP/IP, UDP, HTTP, DHCP, NTP, SSL, IGMP
Supported Video Transport Protocols	RTMP, RTP, RTSP, RTSP over HTTP, MPEG-TS (MPEG-TS is an optional paid license)	RTMP, RTP, RTSP, RTSP over HTTP, MPEG-TS (MPEG-TS is an optional paid license)
Remote	Teradek Core	Teradek Core
AUDIO		
Audio Compression	AAC-LC, MPEG Layer 2	AAC-LC, MPEG Layer 2
Audio Output	Embedded audio output, analog line or mic in, adjustable gain, headphone output	Embedded audio output, analog line or mic in, adjustable gain, headphone output
PHYSICAL		
Dimensions	4.75"W x 3"D x 1.1"H [120.7 x 76.2 x 27.9mm]	4.75"W x 3"D x 1.1"H [120.7 x 76.2 x 27.9mm]
Weight	11.6oz (328.9g)	11.6oz (328.9g)
Construction	Milled Aluminum	Milled Aluminum

	600 SERIES	700 SERIES
INTERFACES		
Local Device Configuration	OLED Display with joystick navigation buttons	OLED Display with joystick navigation buttons
Switches	On/Off and reset switch	On/Off and reset switch
Recording/Storage	SD Card: Full size	SD Card: Full size
Desktop App	Feature-rich web UI for configuration and control	Feature-rich web UI for configuration and control
Mobile App	VUER, Live:Air Action	VUER, Live:Air Action
USB Interface Functionality	Powered USB 2.0 host port	Powered USB 2.0 host port
NETWORK		
Ethernet	10/100/1000 BASE-T Gigabit	10/100/1000 BASE-T Gigabit
Wireless	Cube 675 only - 2.4/5GHz 802.11 ac/a/b/g/n MiMo	Cube 775 only - 2.4/5GHz 802.11 ac/a/b/g/n MiMo
USB	N/A	USB 3G/4G Modem support
RF Channel	Cube 675 only - Auto with 3 modes: (2.4 or 5 Ghz), Auto (2.4 GHz only), Auto (5 Ghz only), Configurable to specific channels	Auto with 3 modes: (2.4 or 5 Ghz), Auto (2.4 GHz only), Auto (5 Ghz only), Configurable to specific channels
Encryption	Cube 675 only - 802.1x, 802.11i, WPA2, WPA and WEP 64/128 TKIP, 128bit AES	802.1x, 802.11i, WPA2, WPA and WEP 64/128 TKIP, 128bit AES
POWER		
Power Input	2 pin circular-locking connector	2 pin circular-locking connector
Nominal Power Consumption	8W, 7W (no WiFi)	8W
Auxiliary Power Input	6-28V DC	6-28V DC

FCC STATEMENT

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 in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

This device complies with Part 15 of the FCC rules and also with RSS-210 of Industry Canada. 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.

EC DECLARATION OF CONFORMITY



Teradek LLC hereby declares that the Slice encoder and decoder are in compliance with Directive 1999/5/EC. The full text of the EC Declaration of Conformity is available at the following Internet address: <https://support.teradek.com/hc/en-us/articles/233429747-EC-Declaration-of-Conformity-for-CE-mark>