TERADEK

CUBE™

CAMERA-TOP

HD H.264 SYSTEM

USER MANUAL

Table of Contents

Introduction

The Cube family is the world's first camera-top streaming HD video solution. The family includes six encoders and six decoders. The Cube Encoder streams HD video over any IP network. The WiFi equipped Cube Encoder creates its own wireless (ad hoc) network, and streams HD video directly to a Cube Decoder, a computer or laptop, a server, or a mobile device with no other networking equipment required. To extended your broadcast range, Cube Encoder can join an infrastructure network by using a wireless router and stream over a LAN or WAN. Cube also streams video over the USB port to 4G modems. Cube features native integration with Livestream.com for turn-key live Internet streaming and content distribution.

Cube Decoders

Cube Decoders are designed for placement on small handheld monitors or large HD displays and feature either HDMI or HD-SDI output. Cube Encoders and Decoders can be purchased in pairs that factory default to a direct connection.

Support Forum

A support forum is located at http://forum.teamvideocube.com/

Check the support forum often for the latest firmware updates and updated documentation.

Video Manual

Online Screencasts

Teradek's website features how-to screencasts to assist with set-up and configuration of Cube. Go to http://cube.teradek.com/training.html

Screencast tutorials are also available on www.vimeo.com/teradek/albums

Example of Screencasts

- TeraCentral
- RED Proxy Recording
- Cube Encoder to Decoder Ad Hoc Networking, plus Pairing
- Cube Encoder to Decoder Infrastructure Networking, plus pairing
- Adjusting Latency in VLC
- Cube network discovery on OSX using Bonjour in Safari
- View Live Streaming Video Using VLC on OSX
- Cube Discovery, OSX, BonjourFoxy in Firefox
- Firmware Upgrade Instructions
- Networking Basics for Cube

Mounting Options

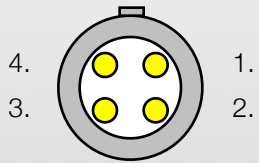
Under-camera Mount

Hotshoe Mount

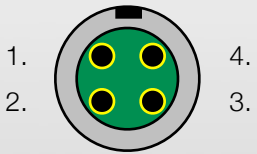
Accessory Top Mount

Decoder to Monitor

Power Connection



Male 0B.304
LEMO on Cable



Female 0B.304
LEMO in Cube

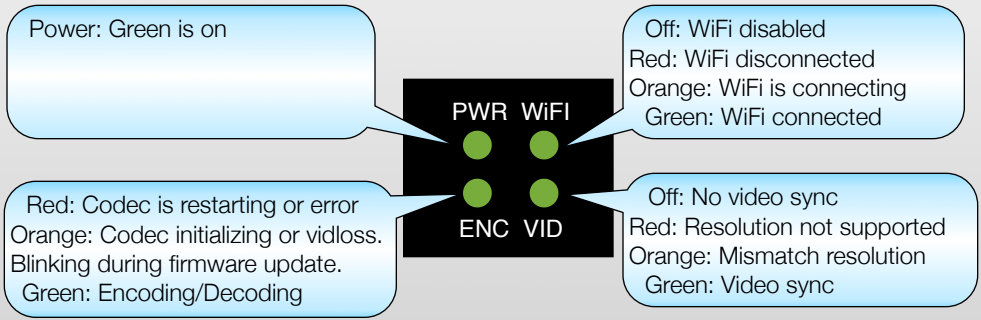
Cube features a 4 pin LEMO connector for power. An AC Power adapter is provided with Cube. Teradek offers accessory cables for a variety of popular connections including PowerTap, XLR, RED ONE specific. Accessories are available at www.teradek.com/cube or from your local Teradek dealer.

LEMO Pin Configuration:

1. DC +
2. GP Input (future)
3. GP Output (future)
4. DC -

Encoder & Decoder LEDs

Standard Operation



Audio & Antenna Connections

Audio Input/Output

Cube Encoder accepts audio input over HDMI and HD-SDI. Cube Encoder also includes a 1/8-inch stereo line-level TRS input. Choose the audio input in Cube's Web Interface under **Video Setup - Device Settings - Audio Input**. Cube Decoder features a 1/8-inch stereo line-level TRS output and embedded out.

Antenna

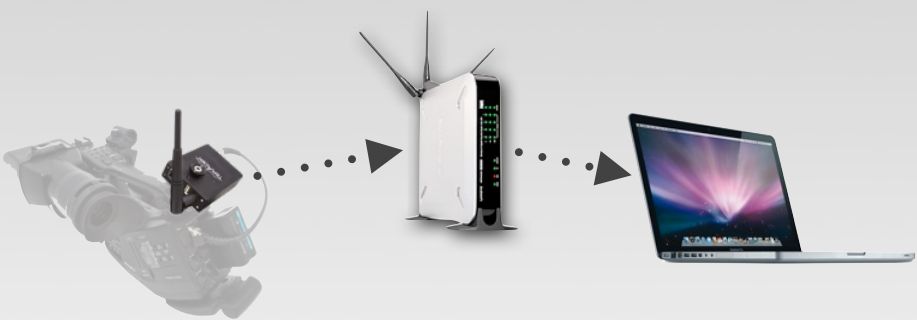
Connect the included antenna if you are using Cube's WiFi functionality. Note: Cube is compatible with RP-SMA antennas.

Encoder to Software Decoder

Ad Hoc Networking

Cube Encoder *creates* the network, the computer *joins* Cube's network. VLC on the computer *decodes* the video for playback.

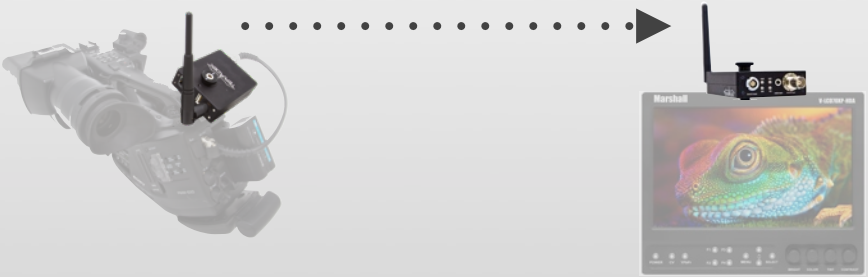
Infrastructure Networking



The router *creates* the network, and both Cube and the computer *join* that network. VLC on the computer *decodes* the video for playback.

Encoder to Decoder

Ad Hoc Network



In this example, the Cube Encoder (on the left) *creates* a wireless network, and the Cube Decoder (on the right) *joins* that network. After joining the network, the devices are *paired* and video streams from the Encoder to the Decoder. WiFi range is limited in Ad Hoc mode, and Cube streams to a single device. Infrastructure mode (through a router) is the preferable network configuration. Ad Hoc mode is for operating in remote locations where a router is unavailable.

A screencast describing Encoder to Decoder Ad Hoc Networking is located at:

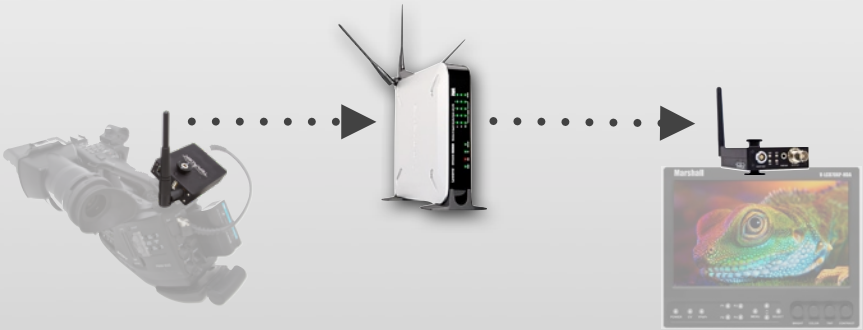
http://vimeo.com/18132088

A screencast describing networking basics is located at:

http://vimeo.com/14644326

Encoder to Decoder

Infrastructure Network



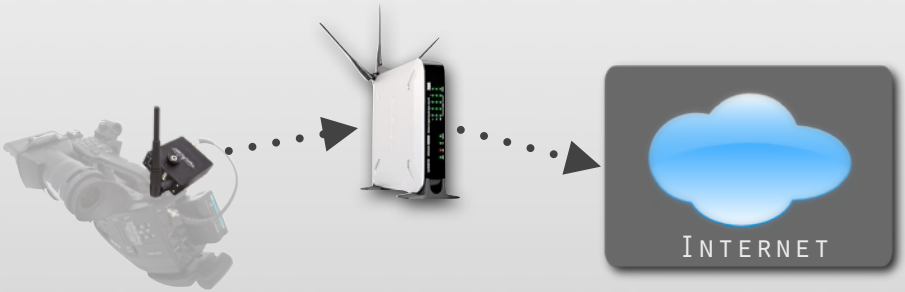
In this example, the wireless router *creates* a wireless network, and both the Cube Encoder (on the left) and Cube Decoder (on the right) *join* that network. After the devices are *paired*, video streams from the Encoder to the Decoder through the wireless router.

Streaming through a router provides both longer WiFi distances and high bitrates, and allows security options.

A screencast describing Encoder to Decoder Infrastructure Networking is located at http://vimeo.com/18132179

Encoder to Internet

Livestream or Custom CDN



Join a network that has broadband Internet connectivity and use either Livestream.com's turn-key content distribution service, or develop your own custom content distribution system.

Encoder to iOS

When streaming to an iOS device, the same ad hoc and infrastructure network configuration rules apply. This example shows Encoder to iPad Ad Hoc.

Using TeraCentral to View Video

Ad Hoc Networking

1. Connect video and power to your Cube Encoder.
2. On your computer, open your wireless networking utility.
3. Choose your Cube from the list of WiFi devices in your area.
4. Launch TeraCentral from the included USB stick, or install TeraCentral on your computer and launch it.
5. In TeraCentral, click the **Launch** button of the desired video stream. The video will begin playing.

TeraCentral Screencast: http://vimeo.com/19053415

Using TeraCentral to View Video

Infrastructure Networking

1. Power-up your router.
2. Connect Cube (Encoder) to video, computer (via Ethernet), and power.
3. Launch TeraCentral from the included USB stick, or install TeraCentral on your computer and launch it.
4. In TeraCentral, click the **Configure Settings** button for your Cube. Cube's menu system appears.
5. Open Cube's Startup Wizard, click **Next**.
6. Click **Configure Wireless Network**, then **Infrastructure Mode**
7. Choose the desired network (i.e. your router), click **OK**.
8. Click **Apply Network Settings** then click **Next**. Cube has joined your wireless network.
9. Confirm Video input then click **Next**.
10. Configure Streaming Video
    - Choose Wireless
    - Choose Software Decoder such as VLC (RTSP)
11. Click **OK**, then click **Next** and then complete the Wizard.
12. Physically disconnect Cube's wired Ethernet connection.
13. Scan wireless networks, choose the same network that Cube just joined.
14. Close and relaunch TeraCentral. Your Cube will appear.
15. In TeraCentral, click **Launch Video**.

Configuring Cube

There are three ways to configure Cube:

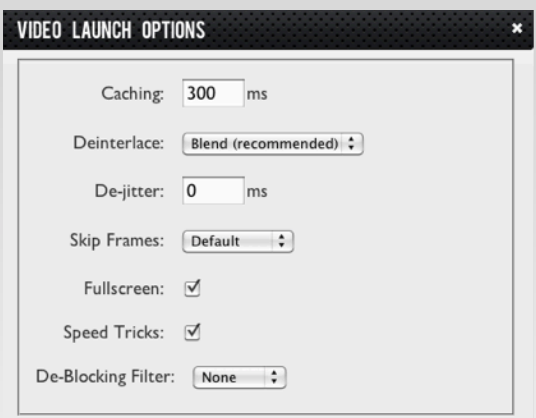
- TeraCentral's Video Options menu
- Using Cube's Setup Wizard
- In Cube's Menu System

TeraCentral's Video Options Menu

When launching video from TeraCentral, VLC's video options are pre-configured and optimized automatically from the settings in the Video Options menu.

Adjusting Latency

The primary functionality of the Video Options menu is to adjust the latency. Enter a value (in milliseconds) in the Caching menu to achieve the desired latency. Lower latency settings (e.g. 100ms) result in occasional digital artifacts appearing in the video, high settings (e.g. 500ms) result in smoother video playback at the cost of a longer delay. 300ms is the default setting.



Entering Cube's Menu System

TeraCentral allows you to use Cube without entering the menu system. For customized configuration, access to Cube's menu system is required. The following steps assume that you've connected to Cube's network.

1. Launch TeraCentral from the included USB stick, or install TeraCentral on your computer and launch it.
2. In TeraCentral, click the **Configure Settings** button for your Cube. Cube's Start-up Wizard or Logon Screen will appear.
3. If Cube's Logon Screen appears, enter your Username & Password and click **Login**.

Note: Cube's Start-up Wizard appears the first time Cube is configured. The Start-up Wizard allows for basic configuration of network, video, and stream settings. Skipping the Wizard takes you to Cube's main login screen.

Logon Screen

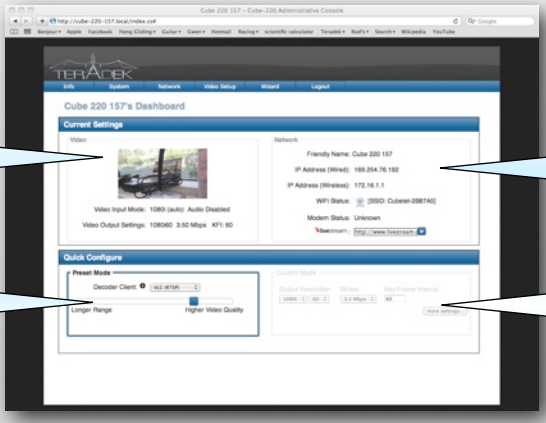
1. Enter the **Username** and **Password***
2. Click **Logon**. The Dashboard appears.

*The default Username and Password is **admin**. Change the password in the **System - Password Change** menu.

Menu System Dashboard

The video thumbnail, video input mode, and video output settings are displayed here.

Choose your decoder, then use the slider bar for quick video encoder configuration



Network settings are displayed here. Click the arrow to download a VLC shortcut used to launch video.

Use this area to customize your stream settings.

Dashboard is the landing page after logging on. Clicking the **Play** button next to the stream downloads a VLC shortcut. Clicking the shortcut in your downloads folder launches the video stream in VLC*.

***Note:** VLC must be installed on your machine to launch video from the shortcut. When launching from TeraCentral, VLC is imbedded in TeraCentral, so there is no need to download it.

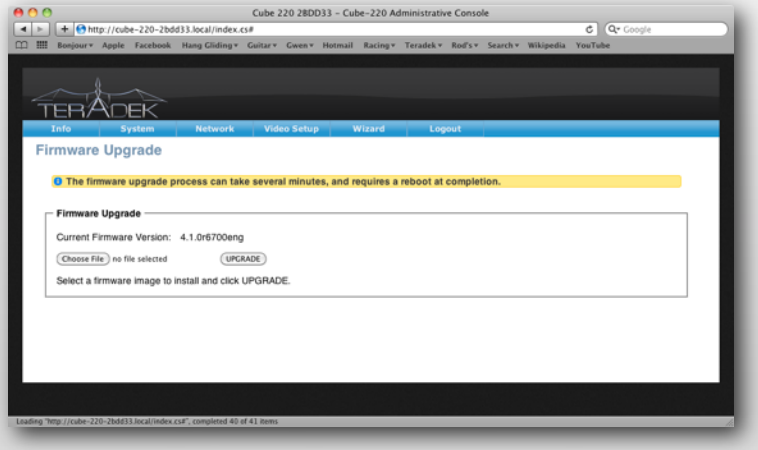
Recommended Bit Rates

For Streaming Video

System	480p	720p	1080i
iPad - Ad Hoc < 100’	1	2	N.A.
iPad - Ad Hoc > 100’	0.5	1	N.A.
iPad - Infrastructure < 100’ to Access Point	2	2.5	N.A.
iPad - Infrastructure > 100’ to Access Point	1	1.5	N.A.
Laptop - Ad Hoc < 100’	2	3	5
Laptop - Ad Hoc > 100’	1	1.5	3
Laptop - Infrastructure < 100’ to Access Point	2	3	5
Laptop - Infrastructure > 100’ to Access Point	2	3	5
Wired Ethernet	3	5	8

Recommended Bit Rates are based on outdoor testing without obstructions between Cube’s antenna and the receiver. Adjust bit rates in the **Setup Wizard** or the **Video Setup - Encoder Settings** menu.

System - Firmware Upgrade



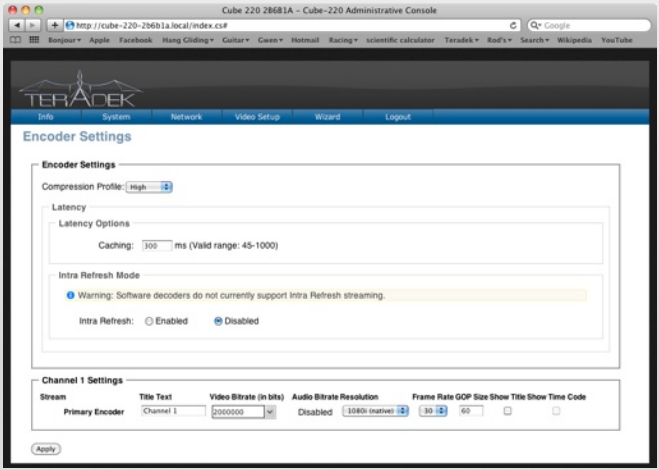
To Update Cube with the Latest Firmware

1. Go to **forum.teamvideocube.com - Customer Care - Announcements** to get the latest software.
2. Disconnect your HDMI (if applicable) before updating the firmware.
3. Logon to Cube's web interface.
4. Click **System - Firmware Upgrade**.
5. Click **Choose File**. Select the firmware update file.
6. Follow the onscreen directions.

Note: Do not unplug Cube during firmware upgrade and reboot process! The Codec LED blinks during the upgrade.

Screencast: http://vimeo.com/14655522

Video Setup - Encoder Settings



Encoder Settings

- **Compression Profile:** High profile provides the highest quality per bit.
- **Caching:** Set the caching value in the decoder to be equal to, or greater than this value. The recommended setting in normal mode is 300ms, and 70ms in Intra Refresh mode.
- **Intra Refresh mode:** Intra Refresh mode allows lower latency settings when used with a Cube Decoder. First, enable Intra Refresh mode, then lower the caching value from 300ms to 70ms. Then power-cycle Cube to enable settings.

Encoder Settings (Continued)

Channel 1 Settings

- **Title Text:** Text overlaid on the video output. Enable or Disable it in the Show Title section (below).
- **Video Bitrate:** Manually adjust the target bitrate. See the Recommended Bitrate table earlier in this manual.
- **Audio Bitrate:** Select the audio bitrate.
- **Output Resolution:** Select the desired output resolution and framerate
- **Keyframe Interval:** GOP size/number of frames between keyframe
- **Show Title - Show Timecode:** Click to display Title Text or Time Code.

Video Setup - Stream Settings

Channel 1 Streams

- **General - Type:**
  - Select RTP if streaming to computers, laptops, Macs, and Cube decoders.
  - Select HTTP Live when streaming to iOS devices such as iPad and iPhone.
  - Select Live Internet Streaming using Livestream.com
- **RTSP Settings:** Enable only if tunneling RTSP & RTP over HTTP is needed.
- **Current Stream URLs:** Clicking the Play button next to the desired link downloads a VLC shortcut to your Downloads folder.

Cube to Internet

There are two ways to stream HD video over the Internet: Using Livestream's turn-key content distribution platform or using your own custom content distribution network.

Livestream.com Native Integration

To configure Cube for Livestream.com:

1. Join any network that has a broadband Internet uplink.
2. Enter Cube's menu system, then click **Video Setup - Stream Settings.**
3. Click the **Type** menu then select **Live Internet Streaming.**
4. Enter your Livestream.com username, password, and channel name.
5. Verify login.
6. Configure the settings as desired, then click **Apply**.
7. To begin broadcasting click **Start Broadcast**.

Cube Button Mode for Livestream.com

- 1-4 secs: Broadcast start/stop - Codec LED flashes Green during broadcasting, red during broadcasting/recording, orange when reconnecting.
- 5-9 secs: Pairing - Codec & WiFi LEDs alternate Green
- 10-19 secs: Factory reset (save network) - WiFi LED cycles all colors
- 20+ secs: Full factory reset - Codec & WiFi cycle all colors

Custom Content Distribution Network

Creating your own content distribution network requires proficiency in IT technologies and IP video. Consult with a network administrator for instructions on streaming video over the Internet.

Red Proxy Recording

When streaming video from a RED Digital camera, Cube is capable of recording proxy files over WiFi in real time, then playing those files back off of a Mac or iPad. This is an ideal solution for creating instant dailies for offline editing and playback.

You can find detailed instructions on setting up Cube's Proxy recording at Teradek's Cube support forum here:

http://forum.teamvideocube.com/viewforum.php?f=18

A video detailing the RED Proxy Recording functionality and setup is located here: http://vimeo.com/17556041

Configure Cube to iOS

For iPad, iPhone, iPod Touch

1. On iPad, open **Settings**. Choose **WiFi**.
2. Choose your Cube from the Choose a Network menu.
3. Open ZeroConfSpy* and choose your Cube. Safari will open displaying the Start-up Wizard.
4. Go to the Streaming page, choose:
   - Wireless
   - iOS device such as iPad or iPhone (HTTP Live)
   - 2.5 Mbps or less
5. Click **OK**. The stream settings are displayed.
6. Click the link. In approximately 10 seconds video will stream.

*ZeroConfSpy is available for free download from the Apple App Store.

Button Functions

Pairing Mode

Activating Pairing Mode

When Cube Encoders and Decoders are paired, it means that when they are on the same network, the Decoder is configured to receive the streaming video from the Encoder. Pairing is analogous to tuning your radio receiver into the correct station. To pair, press and hold the **Reset** button on the Encoder between 1-9 seconds (while not in Canon 5D mode) until the ENC and WiFI LEDs blink green, then release. Within 30 seconds, press and hold the Reset button on the Decoder until the DEC and WiFi LEDs blink green, then release. The Encoder and Decoder are now paired.

Canon 5D HDMI Mode

The HDMI output on the Canon 5D switches from 1080i while in Live Preview mode to 480p while in Record mode. Cube features a Canon 5D mode that prepares the encoder for the resolution switch. To activate Canon 5D mode go to **System - Hardware IO - Button Mode** and select **Resolution Switch (Canon 5D)**, then click **Apply**.

Activating Canon 5D Mode

- 1-4 secs: Canon 5D resolution switch
- 5-9 secs: Pairing
- 10-19 secs: Factory reset (save network)
- 20+ secs: Full factory reset

Reset to Factory Defaults

To restore Cube to factory defaults:

1. Click and hold the reset button for 20+ seconds.
2. LEDs 2 and 3 will alternately blink green, orange and red.
3. Release the button, Cube will reboot automatically.

Factory Configured Cube Pairs

If you bought your Cube Encoder and Decoder as a set, they were paired at the factory to stream video in an ad hoc network configuration. Factory paired Cube's area easily identifiable as the encoder's ad hoc network name will start with "Cubelet" rather than "Cube", and uses the Cubelet network for both the encoder and decoder. To stream video, simply the plug the Cube Encoder into your video source and your Cube Decoder into your monitor and power them up. Video will begin streaming.

Factory Defaulting Cube Pairs

Factory default returns both units to an ad hoc network configuration and maintains the pairing. To factory default your Cube Encoder or Decoder hold down the reset button for approximately 8 seconds until the ENC and WiFi lights begin color cycling. Note: After two seconds the lights will begin flashing green. This is pairing mode. Continue to hold the buttons down until color cycling begins to initiate the factory default, then release.

Create Ad Hoc Network Between Encoder & Decoder

The following steps are also detailed in this screencast:
http://vimeo.com/18132088

1. Configure your Cube Encoder for ad hoc networking (skip if Encoder is already configured for ad hoc)
   - Power-up your Cube Encoder.
   - Using your computer's wireless networking, connect to your Cube Encoder on the infrastructure network where it resides.
   - Use Bonjour in your web browser to locate your Cube Encoder and access the Web Interface and logon.
   - Using the Web Interface or the Start-up Wizard configure your Cube Encoder for ad hoc networking.
2. Power-up your Cube Decoder.
3. Using your computer's wireless networking, connect to your Cube Decoder's network.
4. Use Bonjour in your web browser to locate your Cube Decoder, access the Web Interface, and logon.
5. Navigate to **Network - Configuration**.
6. In the **Wireless Network Interface** box, set **Mode** to **Ad Hoc**, then click **Scan For Wireless Networks**. Select the network created by your Encoder, then click **Apply**.

Your Cubes are now networked. The next step is to pair them.

Network Your Cube Encoder & Decoders Via Infrastructure

The following steps are also detailed in this screencast:
http://vimeo.com/18132179

1. Choose an existing network or create a new network using a wireless router.
2. Configure your Cube Encoder for infrastructure networking.
   - Using your computer's wireless networking, connect to your Cube Encoder's network.
   - Use Bonjour in your web browser to locate your Cube Encoder, access the Web Interface, and logon.
   - Navigate to **Network - Configuration**.
   - In the **Wireless Network Interface** box, set **Mode** to **Infrastructure**, then click **Scan For Wireless Networks**. Select the desired network, then click **Apply**.
     Note: Your ad hoc connection with Cube Encoder will terminate. This is normal. Simply close this browser window and move to the next step.
3. Configure your Cube Decoder for infrastructure networking the same way you configured your Encoder in step 2.

Your Cubes are now networked. The next step is to pair them.

Pairing Your Cube Encoder & Decoder Using the Reset Button

1. Ensure the Cube Encoders and Decoders are on the same network
2. Ensure that your Encoder is not in Canon 5D (HDMI models)
   - Navigate to **System - Hardware IO** in the Encoder menu system and select **Button Mode - Standard**.
3. Press and hold the **Reset** button on the Encoder for approximately 5-9 seconds. When the ENC and WiFi LEDs flash green release the button.
4. Next, press and hold the **Reset** button on the Decoder for approximately 5-9 seconds. When the DEC and WiFi LEDs flash green release the button. The Cubes will pair automatically.

Pairing Your Cube Encoder & Decoder in the Menu System

1. Using your computer's wireless networking, connect to the network where your Cubes are located (either the infrastructure network you've created or the ad hoc network created by your Cube Encoder.)
2. Use Bonjour in your web browser to locate your Cube Decoder, access the Web Interface, and logon.
3. Navigate to **Video Setup - Decoder Settings**
4. In the **Available Video Streams** list, click and drag the desired video into the box to the right, then click **Apply**.

Your Cubes are paired and the decoder is now outputting video.

These steps are detailed in both of the following videos:

- Cube Encoder to Decoder Ad Hoc Networking, plus Pairing: http://vimeo.com/18132088
- Encoder to Decoder Infrastructure Networking, plus Pairing: http://vimeo.com/18132179

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