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Helpful Explanations and a Guide about modern digital Video Technology and its Terms

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What's the Difference Between Interlaced and Progressive Scan?

You must have noticed that a video resolution is followed by a letter "i" or "p", such as 1080i and 1080p. What do the letters mean? Actually, "i" stands for interlaced scan while "p" is short for progressive scan. They are two different kinds of scanning types. What is interlaced scanning? What is progressive scanning? What's the **difference between interlaced scan and progressive scan**? Here we'll explain them and compare them.

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Part 1. **Interlaced Scan vs Progressive Scan: Definition**

1. What Is Interlaced Scan?

Interlaced Scan is an old technology. In interlaced scan, every frame in a video is divided into a number of horizontal scan lines. For example, every frame in 1080i video will be divided into 1080 horizontal scan lines. Then, it will split those lines into groups of odd lines and even lines. A complete frame is displayed in two times. Typically, it paints the odd lines (1, 3, 5…) first and after 1/60 of a second paints the even lines (2, 4, 6…). So, this is interlaced scan. It is used to help display traditional analog TV broadcasts on a

TV screen. Two main interlaced systems are NTSC and PAL:

Field 1 - Odd Lines   Field 2 - Even Lines
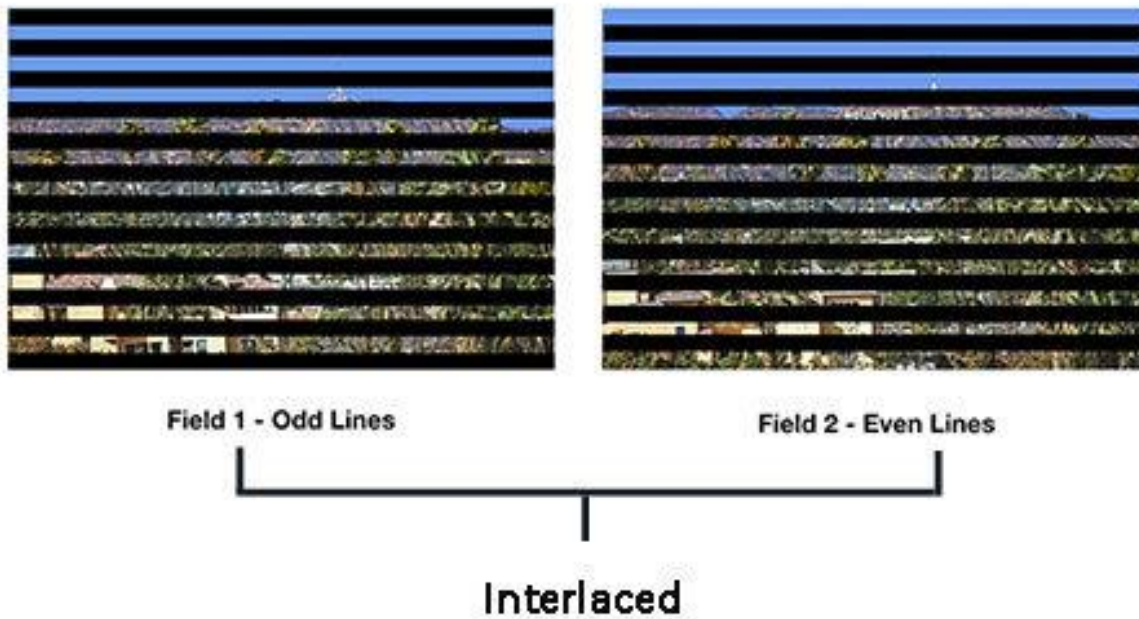
Interlaced

2. What Is Progressive Scan?

In contrast to interlaced scan, progressive scan (aka. non-interlaced scan) draws all the lines of each frame in sequence (1, 2, 3…). This is a more modern display technology. It is used for scanning and storing film-based material on DVDs, most CTR computer monitors, all LCD computer monitors, most HDTVs, and 4K TV.

Frame

Progressive

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Part 2. Interlaced Scan vs Progressive Scan: Difference

The difference between interlaced scan and progressive scan involves how they display a frame. Interlaced video divides a frame into even filed and odd filed to display while progressive video displays the entire frame at once. Interlacing provides full vertical detail with the same bandwidth that would be required for a full progressive scan, but with twice the perceived frame rate and refresh rate.

Well, interlaced vs progressive: which is better scan type? When cost and complexity are factored out, progressive is the better scan type because it reduces flicker and artifacts and provides clearer image.

Interlaced vs progressive video

Part 3. Interlaced Scan vs Progressive Scan: Pros & Cons

1. Advantages

* Advantages of interlaced scan

1. Since only half the frame is transmitted at a time, it effectively reduces the bandwidth requirement by a factor of 2.
2. Thanks to bandwidth reduction, it lowers the cost and complexity of producing and broadcasting content.
3. At a fixed bandwidth, interlaced scan is twice the refresh rate and frame rate of progressive scan.

* Advantages of progressive scan

1. It reduces flicker and artifacts because it transmits the full frame at once.
2. Each frame can individually be captures as still photos, since it is transmitted at once.
3. The reduction of flicker also means less strain to the eyes on prolonged use.

2. Disadvantages

* Disadvantages of interlaced scan

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1. The field frequency is close to the flicker sensitive frequency of human eyes, and the flicker will be obvious when watching a large light-colored background picture.
2. The parity cycle of interlacing scan results in obvious flicker between scan lines, which is most obvious when viewing text
3. The parity cycle of interline scanning results in obvious and neatly arranged line structure lines in the picture. The larger the screen size is, the more obvious the line structure lines are, affecting the embodiment of picture details and the overall picture effect.
4. When viewing very high-speed motion sequences, if the object is moving fast enough to be at different places in the time it takes for both the odd and even lines to be painted on the screen, a disturbing motion artifact will result.
5. To remedy the motion artifact, it may introduce blur intentionally.

* Disadvantages of progressive scan

Compared to interlaced scanning, progressive scanning requires more bandwidth which makes the entire system more costly and complex.

Part 4. **Deinterlacing: Convert Interlaced Video to Progressive Video**

Although progressive scan is better than interlaced scan and most modern displays use progressive scan, interlaced technique is still used. In this case, a process called deinterlacing is required. It converts interlaced signal to progressive scan.

How to Deinterlace Videos and Remove Jagged Artifacts

Nowadays, all broadcast television, cable, satellite, VHS, S-VHS, Beta, Laserdisc, 8mm, Hi8, Digital8 and most DV sources are interlaced. Most analogue cameras and even some modern digital cameras uses interlaced scanning too. But most cathode ray tube (CRT) computer monitors, all LCD computer monitors, and most HDTVs use progressive scan. Therefore, when you play an interlaced video on a computer monitor, you will see noticeable artifacts.

To watch interlaced video on modern non-interlaced displays without harsh interlacing lines, you need to deinterlace the video first. What's the best video deinterlacing software? Here we'll show you how to deinterlace a video using different Handbrake, VLC, Premiere, etc.

What is Video Deinterlacing? Some Basics

Deinterlacing video is the process of converting interlaced video, such as common analog television signals or 1080i format HDTV signals, into a non-interlaced form (progressive video). Interlaced scan and progressive scan are the two kinds of ways to record video.

Interlaced scan: This kind of video uses two sub-fields to generate a video frame in sequence. Field 1 scans odd lines of the image sensor, while Field 2 scans the even lines in the gap of Field 1. If you see a video listed with a letter "i" like 1080i, then it is an interlaced video.

Progressive scan: Also known as non-interlaced/sequential scanning, this kind of video draws the lines of each image in sequence from top to bottom. It is listed with a letter "p" like 720p or 1080p. If you play the interlaced videos on a display that use progressive scanning, you will see artifacts like jagged edges.

Methods: Linear Blending takes a line and then average the pixel values in it with the line below, effectively blurring the frame. This almost completely eliminates the effects of interlacing. At times there may be slight ghosting (instant transition from one thing to another), but the image appears to persist for a fraction of a second and it's really hard to notice.

- It's simple and light on the CPU.
- It's faster with better quality than Yadif, which is known to give pretty nice results with a wide range of sources.

How to Deinterlace Videos with Handbrake?

Handbrake also supports video deinterlacing. There are two options in Handbrake deinterlacing settings: Yadif and Decomb. *YADIF* (Yet Another DeInterlacing Filter) is the most popular deinterlacing filer. It checks pixels of previous, current and next frames to re-create the missed field by some local adaptive method and uses spatial check to prevent most artifacts. *Decomb* switches between multiple interpolation algorithms for speed and quality. Avoid decomb unless you are dealing with the rare case of mixed interlaced and progressive material.

Step 1: Import interlaced video

Download the free video deinterlace software and install it. Click the "Source" button to open a single video file or a folder with multiple interlaced videos.

Step 2: Choose deinterlacing filter

Select an output format for you video, like MP4. Then click Filters on the tab menu and find Deinterlace. Deinterlace video using a combination of Yadif or Decomb using a preset bob, eedi2, or eedi2 bob. If you dont' know how to interlace videos free with Handbrake best settings, here we recommend you two methods for the best quality or speed:

- DeComb EEDI2 (without Bob) is the best image quality. Less aliasing and best missing lines reconstruction. The one which looks more like progressive footage. The problem is: it is very very slow, takes lots of time.

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- DeComb Bob (without EEDI2) is the best quality/speed balance. It has a little more aliasing but not disturbing and it is much faster. Best option if you cannot wait longer.

Step 3: Click Start Encode button to deinterlace video with HandBrake now.
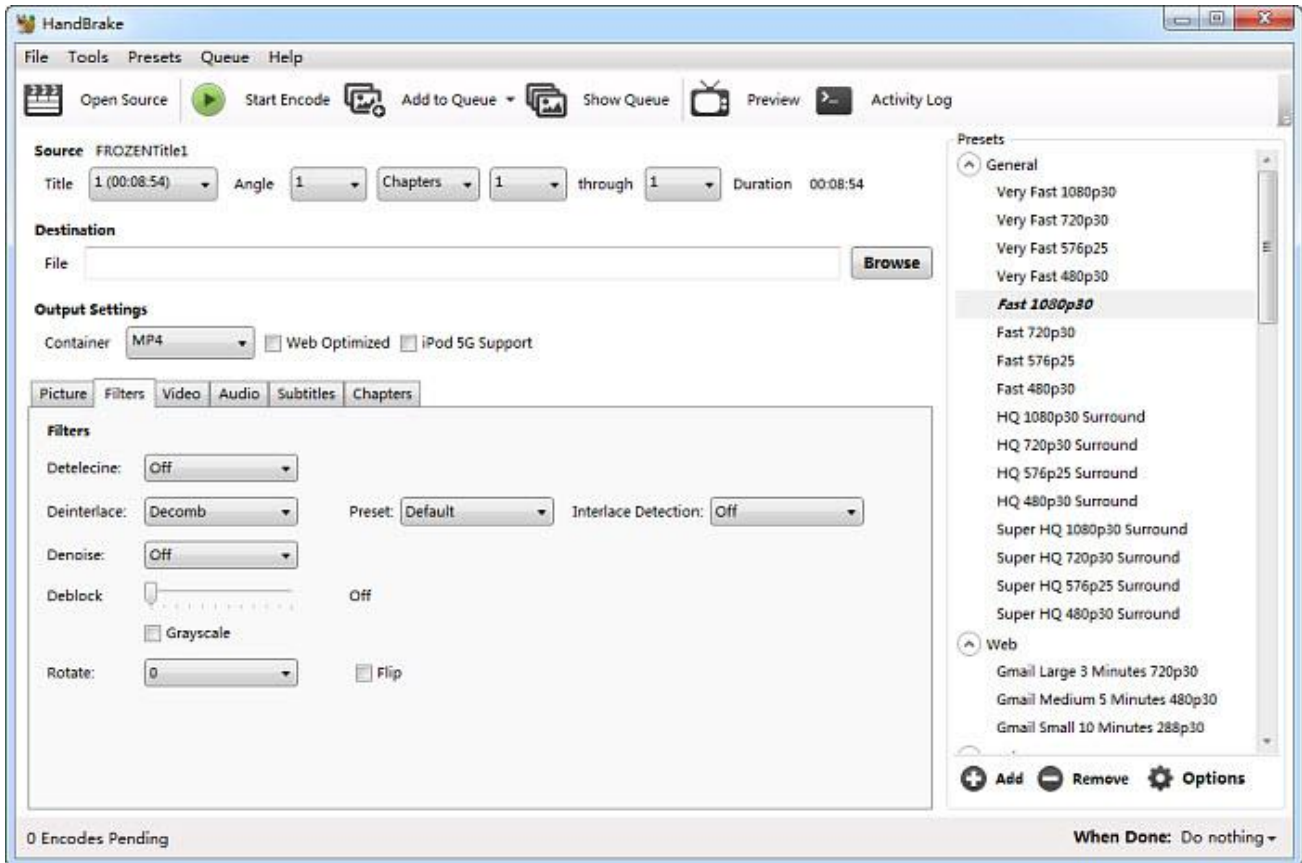
How to Deinterlace Videos with VLC?

If you want to play an interlaced video on a progressive screen without jagged lines, you can use VLC. It has a video deinterlacing feature which is off by default. You can enable the VLC deinterlacing mode easily.

Automate Deinterlacing (On/Auto/Off) in VLC

- Open free video deinterlace software and select Tools on the top menu bar. Then select Preferences.
- Choose Video and open the Deinterlacing dropdown menu. Here are three options: Off, Automatic, and On. For non-tech users, we recommend the Automatic mode. Then VLC will deinterlace a video when it detects interlaced artifacts using a proper method.

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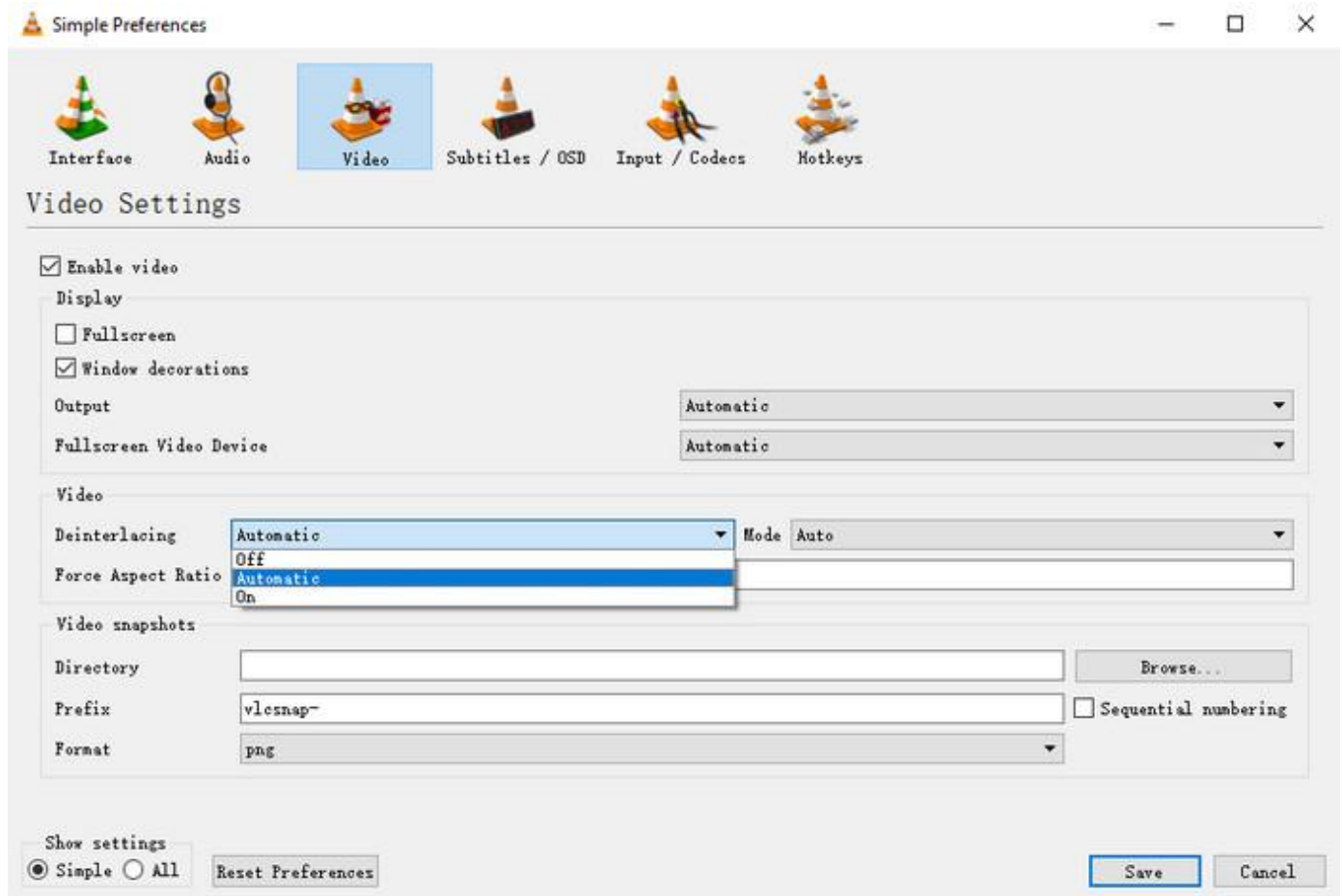
How to enable deinterlace mode in VLC

Enabling Streaming deinterlace mode

The VLC automatic detection is not always reliable. For advanced users, you'd better switch deinterlacing on/off manually when needed.

- Open the free video deinterlacing software and select Tools on the top menu bar. Then select Preferences.

- At the bottom of the Interface, choose All under Show setting.

- Scroll the list and go to Video > Filters > Deinterlace. Then select a streaming interlace mode from Blend, Mean, Bob, Linear, X, Yadif, Yadif (2x), Phosphor, Film NTSC (IVTC). (Don't know how to choose, here is a detailed explanation on VLC deinterlacing modes)

- Click Save and restart VLC.

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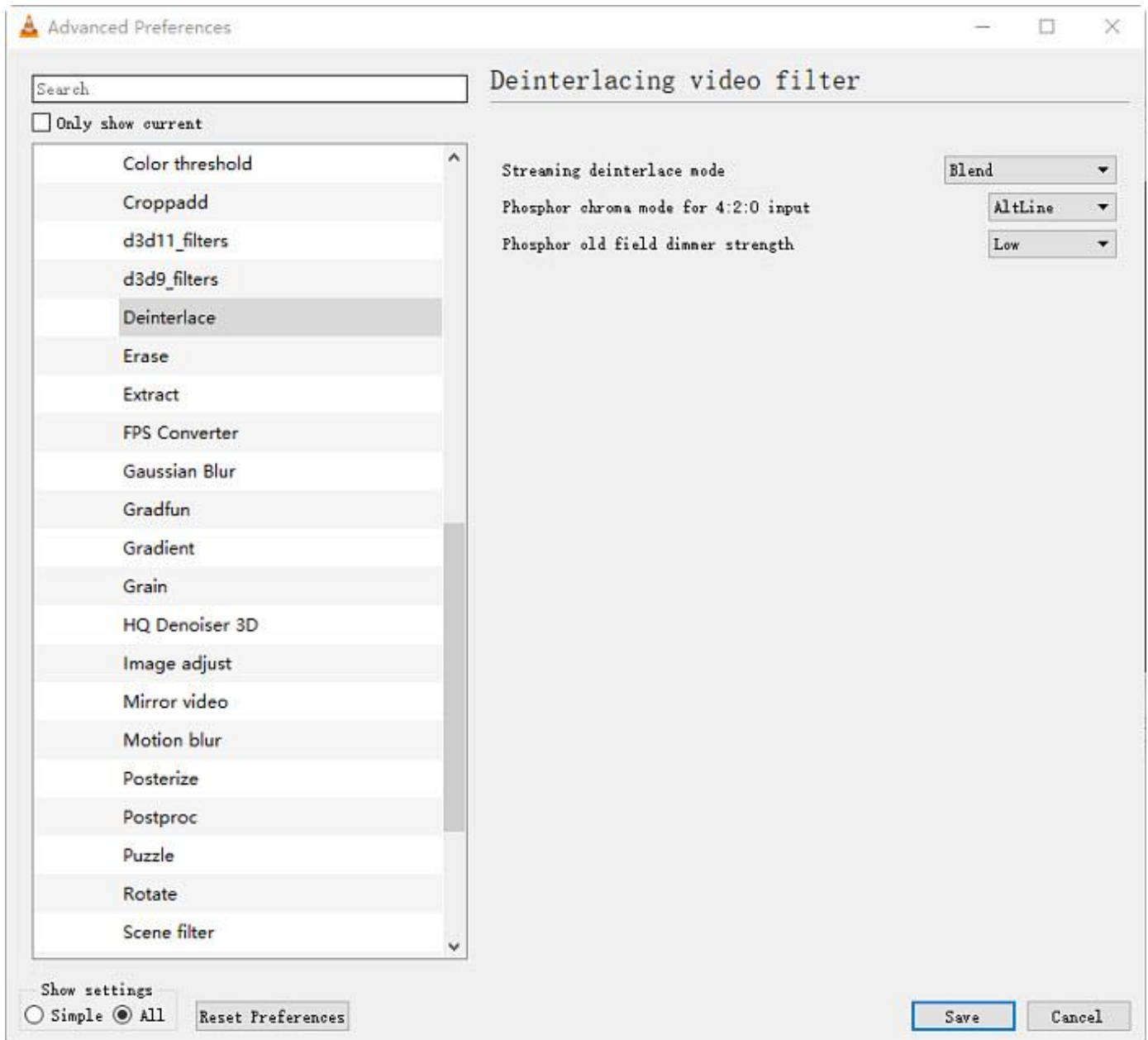
How to deinterlace in VLC

How to Deinterlace Videos with Premiere?

The Premiere Pro has a deinterlacing function which is designed to play clips in slow motion or in freeze frame. It's able to convert interlaced videos into smooth non-interlaced or progressive files by discarding one field and then interpolating the missing lines based on the lines of the dominant field.

Step 1: Open Premiere Pro and your video project. Drag the footage that you wish to deinterlace, and drop it into the timeline on Premiere Pro.

Step 2: Select the clip on the timeline and select "Clip" from the top menu, then "Video Options" then "Field Options." This will open the Field Options Window.

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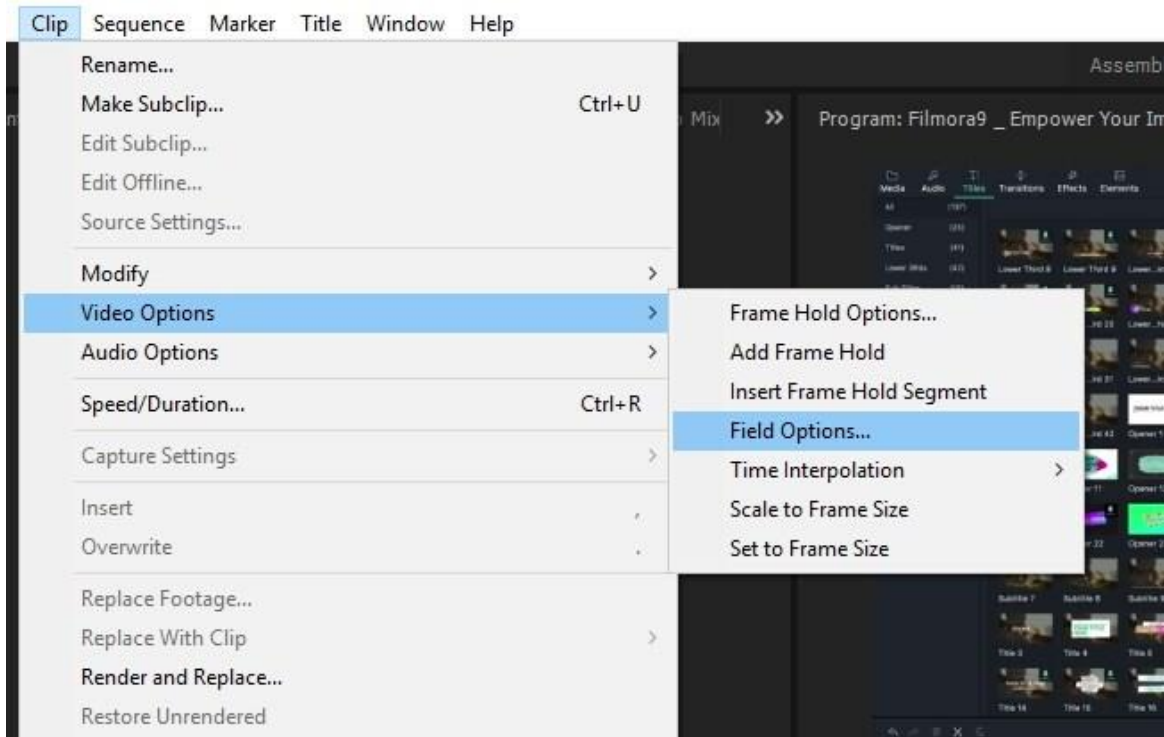
How to deinterlace video in Premiere Pro

Step 3: Then you will see four options: None, Interlace Consecutive Frames, Always Deinterlace, and Flicker Removal. To remove jagged edge artifacts and deinterlace video with Premiere Pro, select Always Deinterlace. This will sort through the frames per second from your video and remove half of the frames that you don't need.

Step 4: Click OK. This process may take quite a longer time.
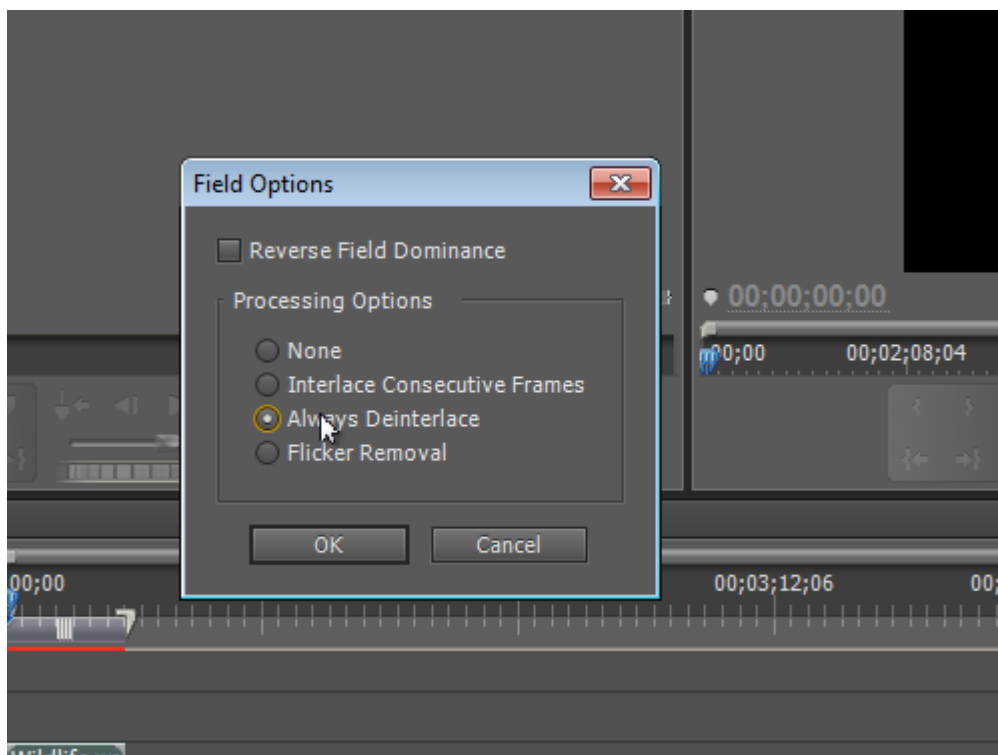
Premiere Pro video deinterlacing

30FPS vs 60FPS: The Benefit and Short Between 30FPS & 60FPS

The adaption of the high frame rate in computer graphics is much more common today than it was before. The term "60 fps" became hot recently because of the higher framerate enhance the graphic quality. Meanwhile, 24fps and 30fps is still the mainstream for videos and movies because it has found the balance between quality & efficiency.

Framerate is important factor for videos.

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Part 1. What is FPS?
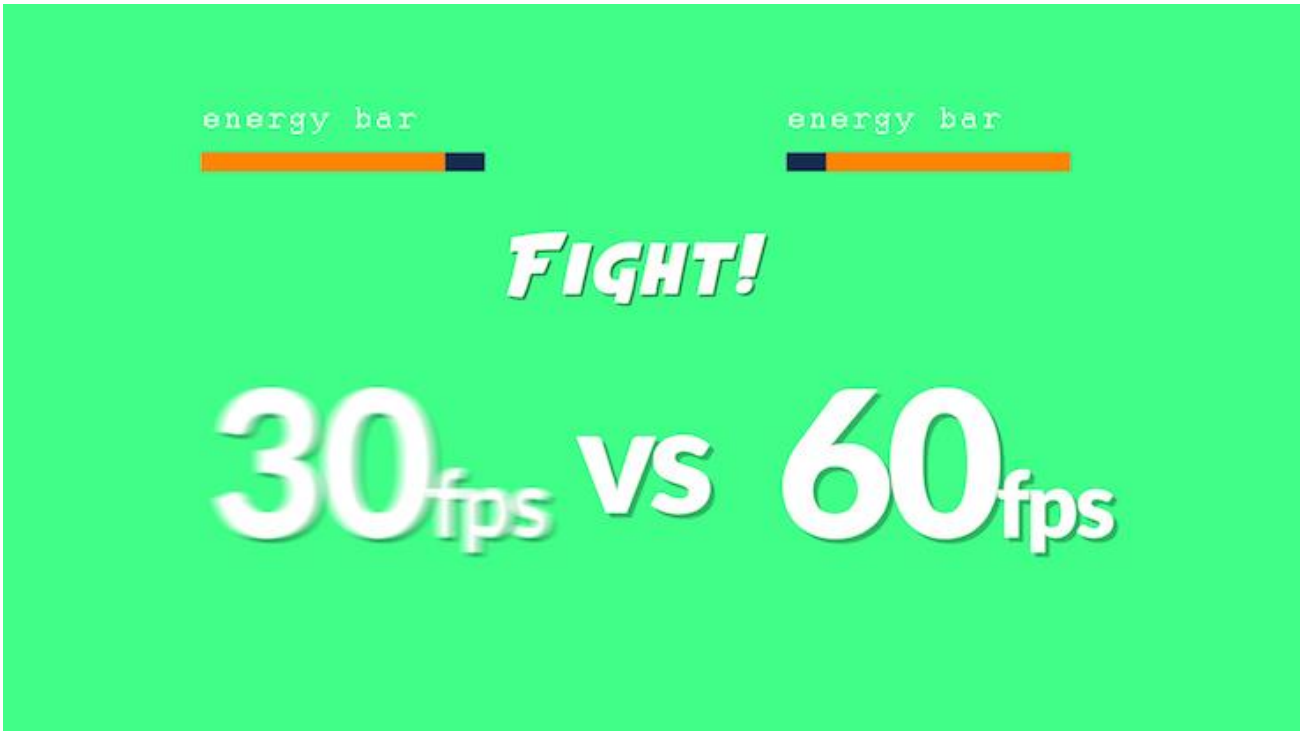
The term "fps" usually stands for "Frame per second". As the name suggests, it means "how many frames that appear in 1 second".

We know that the term: "Movie" refers to "Moving picture". While the pictures passing through our eyes with 24 pictures per second, our visionary system will consider the fast-flipping static pictures (with chronological continuity) are representing the dynamic movement of a real object.

That is to say, when we comparing 30fps video with 60fps video, If you want your project to have the most "cinematic feel" as possible between 30fps and 60fps, pick 30fps for its unique texture

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Part 2. Compare 30FPS and 60FPS in Different Scenarios

The benefit of high framerate has already widely accepted, in both gaming, video recording & streaming, along with social sharing. Both high & low framerate has a beneficial point via different situation.

1. Gaming

Generally, gamer agree that anything less than 30fps is unplayable and higher frame rate results in smoother gaming. 120 or 240pfs is accordingly said to be the best. But there is not realized easily, since 120 fps gaming is realized on condition that the monitor is 120-165hz refresh rates, together if you have a powerful high-end gaming pc. For the most suitable frame rate, right now 60fps is the target goal for most gaming pc, since it has less demanding on consoles. And the upcoming ps5 and Xbox series x will aim for 60pfs in most games.

2. Video Re-coding & Social sharing

The video we could find on the internet & access on the video platform like YouTube, Vimeo. 60 & 30 fps, which offers a better motion to represent when compare it to a lower framerate. When compare 30fps to 60fps, the most internet optimized framerate is 30fps, which giving the priority to video quality & saving space with in the same time.

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Low Frame Rate (24 fps)　　　　High Frame Rate (60 fps)

3. Sports filming, Drone filming

For sports games, a higher to 120fps filming is required to capture the motion of athletes. Modern drone filming can also achieve high FPS filming for special usage or motion catching. And on the audience side, a 60fps sports streaming will have better experience than 30fps. Talk about the drone filming, many devices, like DJI's new product line – Zenmuse series support full optical lens & 60fps, 3840x2160 resolution filming.

60 FPS　　　　120 FPS
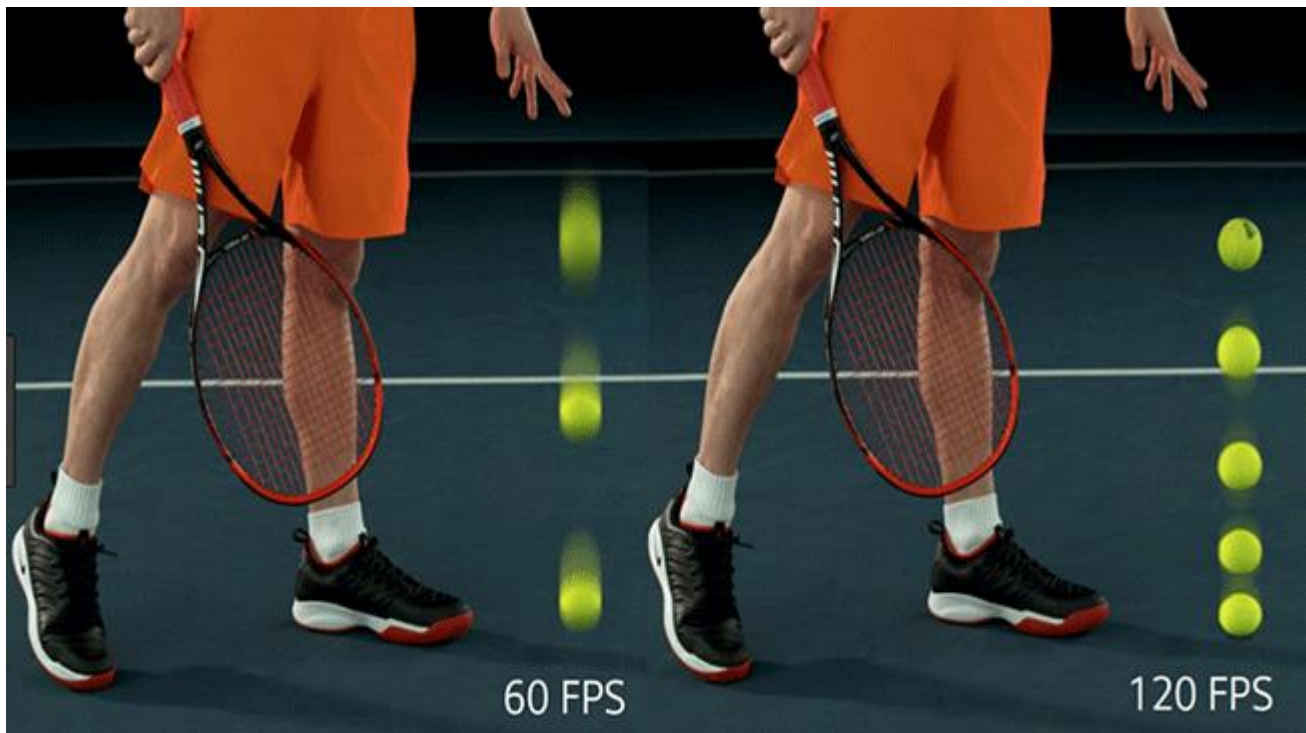
Part 3. How to Convert 60FPS to 30FPS or Vice Versa

As you see, users may need different frame rate for various scenarios. Generally speaking, 30fps video has the best quality & space-saving balance, and 60fps will keep the video with better motion graphics. While sometimes the video is not encoded with the frame rate you need, thus, you need to change the frame rate with a frame rate video converter, such as BeeCut, the SVP converter, and the Wondershare Uniconverter.

Final Words

I believe FPS is not the major factor for when you're recording memories like parties, weddings, baby growth dairies and more events. The memories that are captured are what matter in this case. If you have recorded your video in improper frame rate, just convert video frame rate as you need. Don't let frame rate limit your determination for recording good memories.

CBR vs VBR: Which Bitrate Is Better for Video Encoding/Transcoding

Have you ever tried to convert a video format to another, or rip a music CD to MP3, AAC or WMA? After the conversion, we can easily find the format change, and the video or audio source can be played on the target devices. However, there is a lot that goes on behind the encoding to deliver high-quality outputs. CBR or VBR could matter most. So, what's the difference between CBR and VBR? Which bit rate is better for video encoding or transcoding? Scroll down...

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## *Part 1.* What Is CBR and VBR Encoding

Before everything, you should know what is bitrate. Firstly, Bitrate measures the amount of data that is transferred over a period of time. Video bitrate is measured in kilobits per second (kbps), which affects the quality of a video. The video with a higher bitrate has the higher quality.

However, there are two types of bitrates, namely CBR and VBR, which encode your video differently.

What's CBR Encoding?

Constant bitrate, which is commonly abbreviated to "CBR", refers to transmitting data at the same bitrate. For example, 3000kbps, which means the video will be encoded in 3000kbps from beginning to end. If your video is encoded in constant bitrate, it means that it's not responsive to the size or complexity of the files.

CBR encoding is the most effective solution for video streaming. As there is usually a limited bandwidth on streaming platforms, CBR precisely can take the full advantage of the capacity to reach the best quality. But CBR is not suitable for local media storage, since it's not competent enough to encode complex video scenes. This could lead to quality degradation on complex scenes and waste of bitrate on simple scenes.
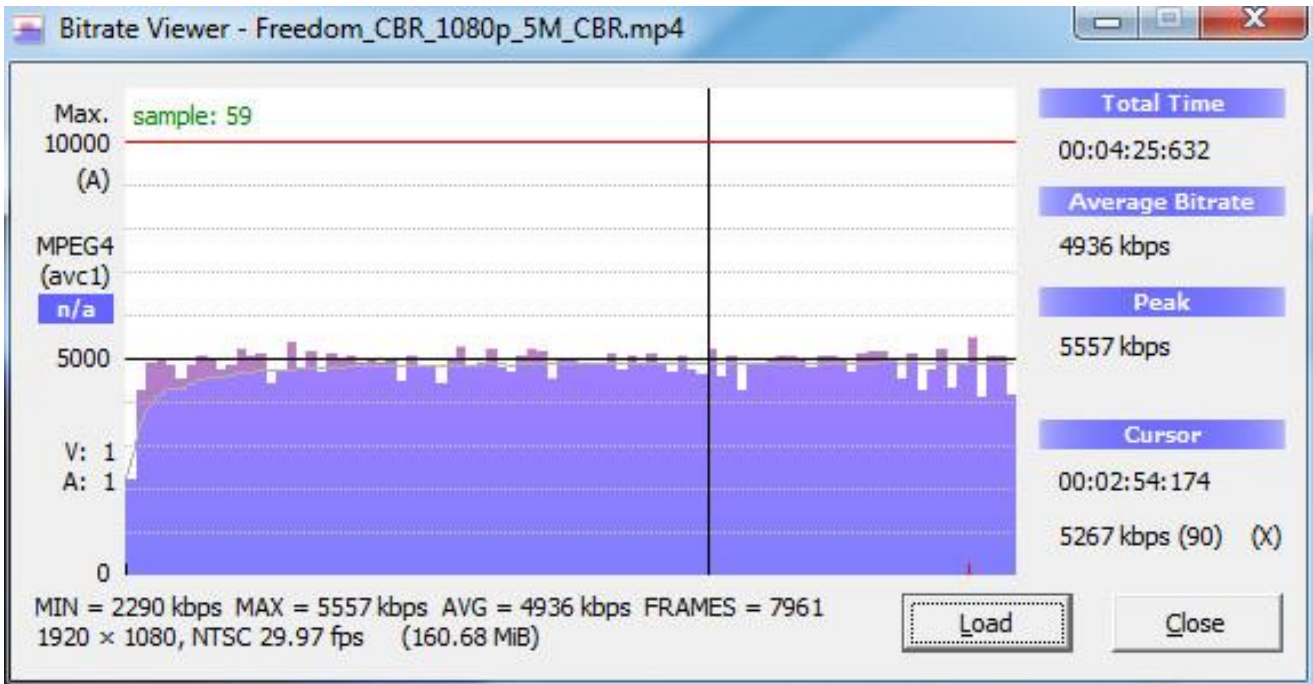
What's VBR Encoding?

Variable Bitrate (VBR) allows the bitrate of an audio file to dynamically increase or decrease within a target range. If your video is encoded in variable bitrate, segments of data will be packaged by their complexity so that the transmission is optimized. That is to say, in VBR encoding, the bitrate will dynamiclly go higher or lower based on different scenes, namely increased for complex scenes and decreased for simple scenes.

Thus, VBR is more suitable to storage multimedia files than CBR. But it may take more time to encode. And you may run into incompatibility issue on some media players or devices since they are not able to decode videos in VBR.
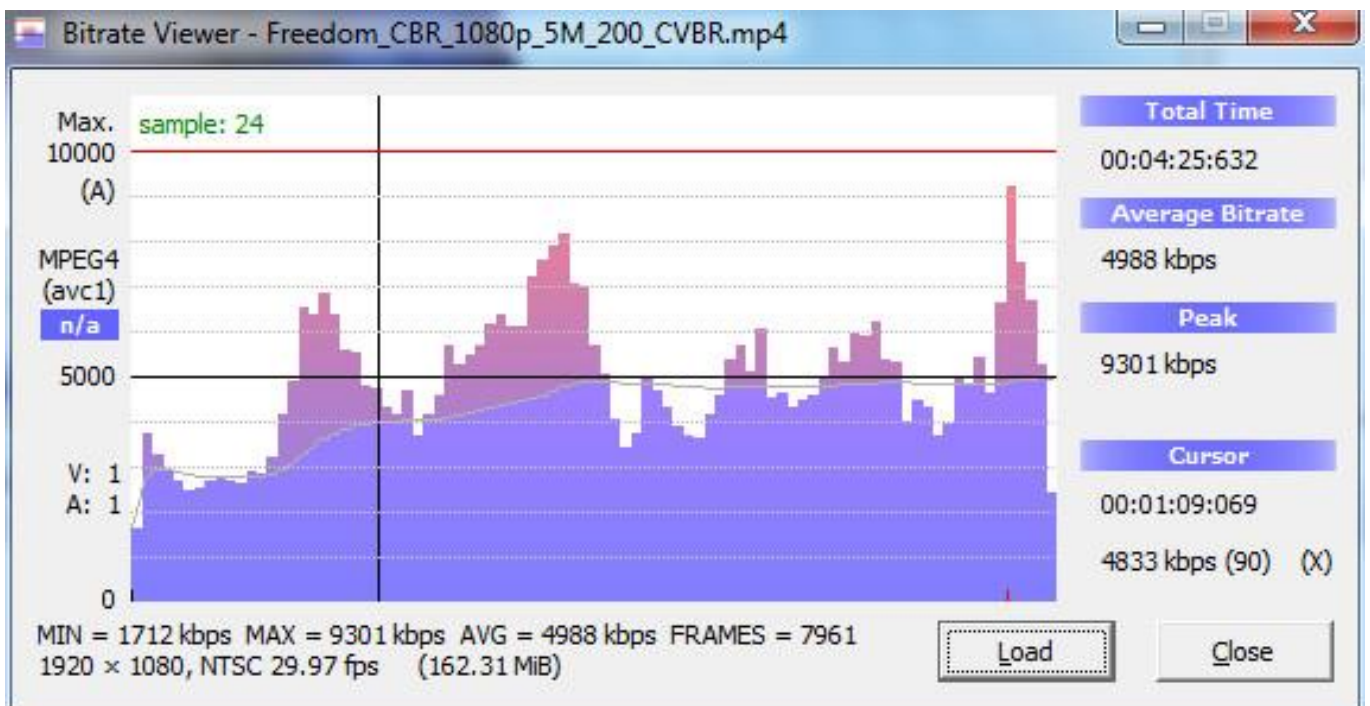
Part 2. CBR vs VBR: What's The Difference?

You may have heard about a lot about conclusions about CBR and VBR comparison. For example:

1. CBR delivers overall lower quality than VBR.
2. Constrained VBR delivered the highest quality.
3. CBR-encoded video can exhibit transient quality drops, sometimes dramatic.
4. Using 110% constrained VBR seems to avoid these quality issues without introducing significant data rate variability.
5. In most instances, encoding with 200% constrained VBR delivers the maximum quality.
6. ...

If you're still confused on what's difference between CBR and VBR, here we've made a conclusion for the pros and cons of CBR and VBR encoding.

	CBR	VBR
Pros	Fixed quality and more control over audio quality Quicker encoding speed Wider compatibility for media players and devices More suitable for multimedia streaming	Smaller file size More efficient use of storage space Flexible reduction in bitrate
Cons	Take up more storage space Lower quality for complex scenes processing Inflexible	Less widely supported Take longer to encode

Part 3. When to Use CBR or VBR

You see, CBR and VBR are both important for video and audio transcoding. Neither is better than the other since they are served as the best in the specific purpose. Here, we'd like to talk about several uses' cases for CBR and VBR.

1. **Live Streaming:** CBR is the best setting for live streaming as it owns more reliable for time-sensitive data transport.
2. **VOD Transcoding:** Constrained VBR can be the optimal option for on-demand video transcoding, since it can handle larger files while still maintaining some sense of consistency.
3. **Audio-only Streaming:** Likewise, it's best that CBR for live audio broadcasts and VBR for on-demand audio streaming. But for those audio encoders which don't give you an option to choose, either option could be fine. Of course, go with CBR audio for live broadcasts and VBR for on-demand audio streaming.

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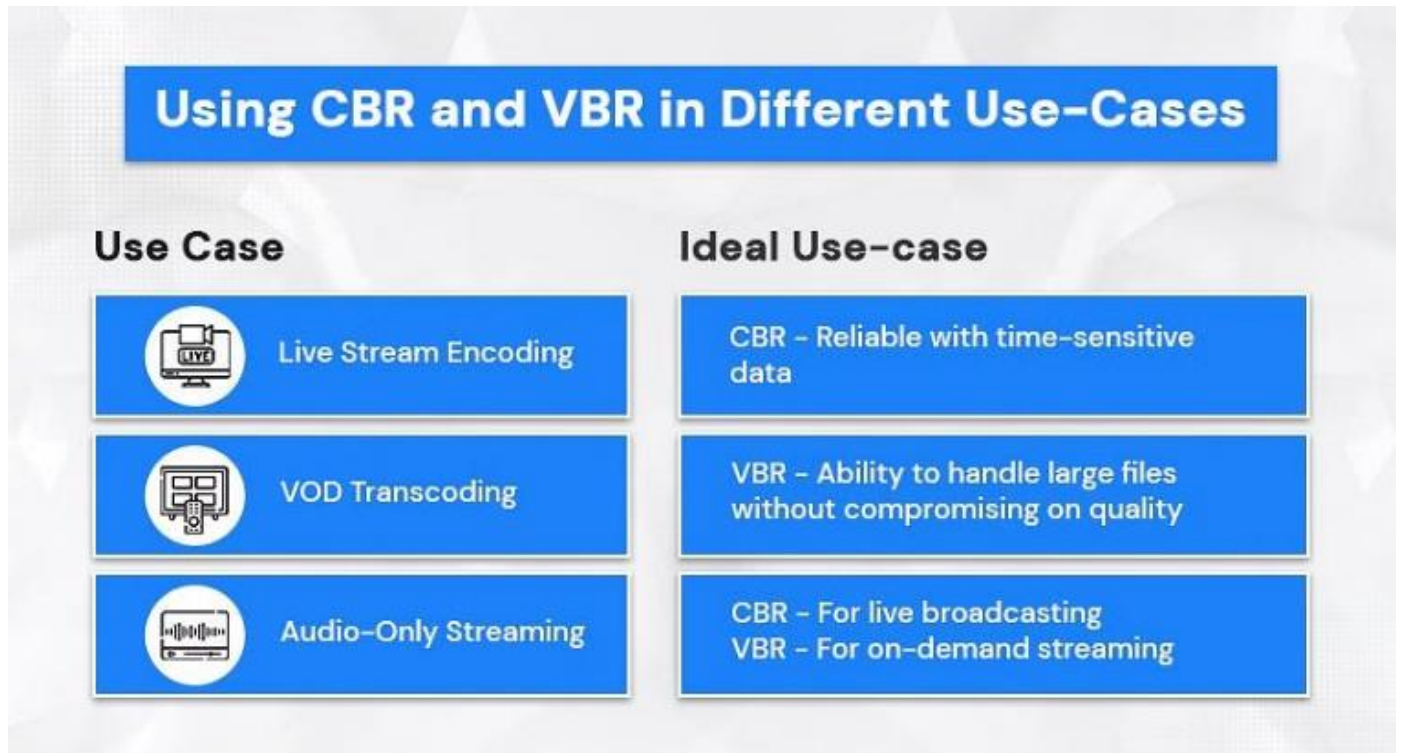
Part 4. FAQs

1. Is VBR better quality?

VBR produces significantly higher quality at similar bitrates. The primary benefit of VBR encoding is that it allocates a higher bitrate to the more complex segments of media files and lower bitrates to the simple segments.

2. What is the best bitrate for 1080p 60fps?

6,000 kbps. If you're going for the peak quality stream at 1080p and 60 fps, you will need a bit rate of at least 4,500 kbps. And depending on the overall strength of your Internet connection, you should be able to increase that to 6,000 kbps for better streaming performance.

3. Is VBR 1 pass or 2 pass better?

2 pass VBR will give you better encodes at a slightly lower data rate than 1 pass VBR. Both usually provide better (or as good) encodes at significantly lower overall file sizes than CBR (Constant Bitrate).

What Are the Factors that Affect or Decide Video Quality?

What factors decide video quality? The complete answer should be resolution, frame rate, bit rate, video codec, bit control mode and bit depth.

What makes video quality better? Besides resolution, frame rate and bit rate, video quality are also affected by video codec, bit depth, etc.

Questions
- *What factors determine the quality of a video?*
- *How to avoid video quality loss when transcoding or uploading to YouTube?*

Answers

1. The factors that determine the quality of an uncompressed videos are: video resolution, video frame rate and macroblock.

2. The factors that decide a compressed video quality include: Video resolution, frame rate, bit rate, codec, bit control mode (macroblock), Bit depth (color depth).

What are the factors that affect or decide video quality?:

Technically, there is no way to 100% avoid loss of data when compressing or transcoding a video. That's what encoding is designed for, to clear redundant information as much as possible. Maybe it causes quality loss. And the reason for "maybe" is that it can be prevented visually when conducting in a proper way with a professional-level [video encoder](#).

4k 60fps: Everything You Should Know about It

The age of 4K 60FPS is here. In March 2015, YouTube tested a handful of 4k videos and increased the frame rate cap to 60 frames per second in a bit to bring viewers a far smoother streaming experience. And taking 4k footages at 60fps feature has become a new norm, which is especially true in the latest flagships, e.g. iPhone 12, GoPro Hero 9, DJI FPV, Sony A7S III, etc. So, in this post, you will be led to learn all about 4K@60fps video, incl. the best cameras for taking 4k footage at up to 60fps, minimum hardware system required for playing 4K@60fps video, common errors with 4k 60fps videos, and more.

What is 4k at 60fps?

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4K refers to the number of pixels, 4 times the overall pixel count of Full HD 1080p. FPS refers to the frequency at which consecutive images or frames appear on a display per second. The 4k@60fps means an image with a resolution of 3840x2160 or 4096x2160 pixels is displayed 60 times per second. Frankly, there are some other types of frame rates, e.g., 24fps, 30fps, 120fps, except for 60fps. Which is better, 4k 60fps or 4k 30fps? Why is 4k 60fps important to play 4k UHD content? Here are specific usages and reasons why 60fps is the best frame rate for 4K 2160p video.

- 24fps – It is the global standard for cinematic viewing and is also widely used by filmmakers.
- 30fps – It is widely used in TV broadcasts and for soap operas. A lot of apps such as Instagram uses 30fps.
- 60fps – It delivers a smoother picture look. It is widely used in HD/4K TV, games, sports, and slow motion. Typically, a video recorded in 60fps is slowed down to 30/24fps in post-product to create that smooth slow-mo effect.
- 120fps – Used in very slow motion.

Dispute of the compatibility between 4k content and frame rates has never been stopped. In fact, 4k videos at regular 24 or 30fps deliver detailed imagery only when they don't move. The truth is creating 4k at 24 or 30 fps can result in less fluid but jolty or stuttering footage, especially in moving scenes, because of the heavy amount of motion blur. So, making a frame rate up to 60fps is a necessity for 4K ultra-HD footage because it can capture far more detail in greater clarity and the movement appears far smoother than that of 24 and 30fps. That's why 4K videos with a lot of motion, such as games and sports will benefit from the 60fps rather than 30fps or 24fps.

Part 2. Which Cameras shoot 4k video at 60 fps?

Filming at 4k 60fps makes your footage look crisper, smoother and boost your post-production plans. But which camera shoots 4k video at 60fps? We've rounded up the best 4k 60fps cameras, including action cams, drones, vlogging cameras, smartphones, and more.

About the best 4k cameras to buy :

Best 4k 60fps action cam: GoPro Hero 9 Black

This is the best action cam you can shoot not only 4k 60fps footage but also record at 5k 30 frames per second. You can choose to schedule the specific duration, from 15 seconds to 3 hours. On top of that, Hero 9 Black edging over other 4k 60fps cameras is its ability to accommodate a bigger and powerful battery and new Max Lens Mod to give you SuperView and max stabilization. Below are the detailed specs:

- Media format: MP4 (h.264/AVC), MP4 (H.265/HEVC)
- Max video bitrate: 100Mbps
- Memory storage support: up to 256GB
- Still Image Resolution: 20 MP
- Resolution/Frame rate: 5k 30/24fps, 4k 60/30/24fps, 2.7k 120/60fps, 1080p 240/120/60/30/24fps.
- Battery: 1720mAh
- Connectivity: WiFi and Bluetooth, GPS, auto offload to phone, connects to GoPro app.

Best 4k 60fps drone: DJI Air 2S

It is easily the best mid-range 4k 60fps drone for most uses who dream of updating to DJI Mavic Air 2. It is equipped with a new 1-inch image sensor and large 2.4um pixels, the drone can take 5.4k/30fps and 4k/60fps video. It's important to note that the video bitrate of the Air 2S is 150Mbps, 30Mbps more than the predecessors. Mastershots is specifically designed for beginner flyers. This is a little caveat that slight cropping in 4k 60fps mode will be noticed on the Air 2S.

- Media format: MP4/MOV (H.264/MPEG-4 AVC, H.265/HEVC)
- Max video bitrate: 150Mbps
- Memory storage support: FAT32/exFAT, up to 256GB
- Still Image Resolution: 20 MP, 1" CMOS sensor
- Resolution/Frame rate: 5.4K/30p, 4K/60p, and 1080p/120p video
- Battery: 3500 mAh, 6 hours (4 hours when charging a mobile device)
- Connectivity: Lightning, Micro USB, USB-C

Best 4k 60fps cameras for vlogging: Panasonic GH5

Panasonic's GH5 has long been a favorite for vloggers, which introduced a new Venus Engine processor to take 4k video at up to 60fps, 10-bit 4:2:2 internal recording without cropping. It features Dual I.S. 2 designed to render sharper and clear imagery, in combination with the sensor-shift image stabilization technology.

- Media format: MP4/MOV (H.264/MPEG-4 AVC, H.265/HEVC), AVCHD
- Max video bitrate: 150Mbps
- Memory storage support: SD Memory Card, SDHC Memory Card, SDXC Memory Card
- Still Image Resolution: Live MOS Sensor
- Resolution/Frame rate: 4k1080p 60/30/24fps, 1080p 60/30/24fps
- Battery: 1860mAh, approx. 410 images
- Connectivity: Wi-Fi, Bluetooth

Best 4k 60fps smartphone: iPhone 12

Apple iPhone 12 features a 12MP TrueDepth front camera and impressive 12MP wide and ultra-wide cameras at the back, meant to allow you to shoot 4K videos at 60fps, whether they are chilling with your skateboard, vlogging in the streets, or taking underwater at a pool party. It's available for you to edit your 4k 60fps footages, thanks to the A14 Bionic chip.

- Media format: HEVC, H.264
- Max video bitrate: 110 Mbps
- Memory storage support: up to 256GB
- Still Image Resolution: 12MP camera
- Resolution/Frame rate: 4k 60/30/25/24fps, 1080p 60/30/25fps, 720 30fps, slo-mo 1080p 240/120fps
- Battery: 2815 mAh, up to 15 hours video playback.
- Connectivity: Wi-Fi, Bluetooth, 5G

Of course, since the above cameras, the later versions of GoPro, DJI, and iPhone also shoot 4K 60fps footage easily. Even some cameras like GoPro Hero Black 10 are able to shoot 4K in 120fps.

What conclusion can be drawn from the list of 4k 60fps cameras?

1. 4k 60fps recordings are generally encoded in a computer-intensive HEVC codec. Please make sure your computer is compatible with the new codec standard.

2. 4k at 60fps setting features a higher frame rate and higher video bitrate, averagely ranging between 100Mbps and 150Mbps. So how much storage space does 4k video at 60fps take up?

Here is an equation: **File Size = Bitrate (kilobits per second) x duration**.

Based on the formula, you can know a 1-minute 4k 60fps video will take up over 1Gb size, which is a huge space log. Consequently, it leads to bigger video files, and longer export and uploading times.

Part 3. Common Errors with 4k 60fps videos while playing and sharing

1. 4k 60fps is a huge space hog. As is mentioned above, 4K 60fps video records more data and results in huge file size, which quickly swallows up your device or drive's storage space. You will need to compress 4k 60fps video to a friendly and smaller size first.

2. It's choppy and laggy to play 4k 60fps video on elder PC, Mac, iPhone, iPad, and more. Processing 4K videos is demanding. It asks for modern hardware. Or else, playback or editing 4K video at 60fps or even

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30fps will be stuttering, lagging and even lead to software crash. Consequently, it's a must-have to convert 4K 60fps video to a regular 1080p/720p video for smooth playback or editing.

3. Some media players or devices cannot import or recognize 4k 60fps video sometimes and prompt some errors like "codec not supported". 4k 60fps video can be encoded in HEVC, which must your media player or device preinstalled with the codec to fix the compatibility problem. For example, Windows 10 asks you to pay $0.99 for HEVC video extension codec installation. Or you will need to convert HEVC to H.264 for better compatibility.

4. 4k 60fps video stuck uploading. Taking a 4K 60fps video doesn't necessarily mean you can upload it with ease. In general, it is slow to share the huge size video, and the image will be blurry due to inadequate compression of the social media itself.

5. iMovie won't export 4k video at 60fps. iMovie supports editing 4k 60fps clip but it cannot export the 2160p video at 60fps. The highest project resolution setting that you can have is 4k 30fps in iMovie. You have to rely on other video editing software for help.

Big in size	Laggy while editing	Video stuck during upload
Choppy/stuttering playback	High CPU usage	Unsupported video codec
Video frame drops	Audio video out of syn	Blurry/pixelated quality

Part 4. Troubleshoot 4K errors: How to Play 4k 60fps Video smoothly on PC systems?

4k 60fps video produces a huge file size that eats up storage space and lengthens the video uploading processing. The bad compatibility with HEVC, together with higher video resolution and frame rate makes it hardly a seamless experience to play on PC, Mac, TV, mobile, let alone share on YouTube, Whatsapp, or so. But you can fix the video playback error that 4k 60fps brings by following the suggestions.

1. Change power plan to increase system performance. You can open the Run dialog box by pressing Windows + R keys > Input powercfg.cpl and press Enter > choose High Performance under Select a power plan in Power Options window.

2. Update your hardware system to fix 4k 60fps video lag. Here are the recommended settings for playing 4k 60fps video.

- GPU: First of all, you need to know that software decoding is CPU intensive. So, playing 4k video will be stuttering or choppy, even if you are using i7/Ryzen5 or above. We highly recommend you rely GPU to decode 4k video. To handle the 4k HEVC 10-bit video, you can take advantage of Nvidia's PureVideo VP7 or above, AMD's UVD 6.3 or above, and Intel's QSV.
- Hard disk space: at least 200GB for a 3-hour 4k 60fps movie.
- Video memory and GPU requirement: 6000MHz and 1100MHz respectively.
- RAM: 8GB or above
- Monitor or projector: 4k supported
- HDMI: HDMI 1.4 only supports 4k video. You have to upgrade to HDMI 2.0 or above to output 4k 60fps video.

3. Download a 4k video player that can well handle 4k 60fps video playing, such as 5kplayer.

4. Compress large 4k 60fps video file to smaller 1080p file.

4k video playback requires a high-end hardware system, including CPU, memory, storage, to graphics. If any of them doesn't meet the requirements, you will run into a problem. One feasible way to fix the 4k 60fps video playback error is to convert and compress the 4k video file with a tool such as Free Video Converter. With it, you are allowed to:

- Compress large 4k video size by 90% without losing quality visually.
- Change 4k video resolution, codec, format, bitrate, frame rate as per your needs.
- Finish 4k video conversion at a lightning-fast speed.