

## Audio and Video File Formats and File Sizes

### Audio file formats:

**AIFF** **Audio Interchange File Format** is one of the most common audio file formats used on both Macintosh and Windows. It is cross-platform compatible, and most CD writers can accept AIFF files when writing a Red Book audio CD.

**WAV** **Wave** - Windows native audio format.

**MP3** **MPEG-1 Audio Layer-3** format offers a very high rate of compression for audio files (about a 12:1 ratio) while preserving the original level of sound quality to the ear. Because of its high quality at small size, mp3 has exploded in popularity, and many sites offer mp3 files for download (most are offering these files in violation of copyright).

Digital audio is typically created by taking 44,100 16-bit samples per second (Hz) of the analog audio signal, this means that one second of CD-quality sound requires 1.4 million bits (about 176K bytes) of data. Using a knowledge of how people actually perceive sound, the developers of MP3 devised a compression algorithm that reduces data about sound that most listeners cannot perceive. MP3 is currently the most powerful algorithm in a series of audio encoding standards developed under the sponsorship of the Motion Picture Experts Group (MPEG) and formalized by the International Organization for Standardization (ISO).

**MOV** **QuickTime movie file** - Audio-only QuickTime files are sometimes useful.

**AU** **Sun audio format** - Native format on Sun/UNIX systems, and common on the Internet. Handles 8- and 16-bit uncompressed sound, and  $\mu$ Law encoding.

**SD2** **Sound Designer II** - Native format of DigiDesign's Sound Designer pro audio software. Also used natively by Macromedia DECK II and many others.

**SND** **Sound Resource file** - Apple-standard format for sound file resources dating back to the earliest Macs. Not commonly used these days.

**SE** **SoundEdit** - an 8-bit file format native to older versions of SoundEdit. Contains sound data in the data fork, and loopback location, selection (cursor) location, waveform color, labels, recorded pitch setting, and playback pitch setting in the resource fork.

**SE16** **SoundEdit 16** - Native format of SoundEdit 16, includes tracks, cue points, spectral data, and optionally System 7 information, as well as all the information in the original SoundEdit format.

**System 7 Sound** - a format introduced in version 7 of the MacOS, allowing desktop "double-click" playback.

## **Important Terms for Audio and Video:**

**bit depth, sample size or resolution** - different terms to express the number of bits used to represent each sample of an audio signal. Standard bit depths are 8, 16 and, newly on the pro audio scene, 24. The more bits in each sample, the more "steps" can be expressed, and thus the more accurately the digitized audio file can represent the original (analog) audio signal.

**data rate** - the amount of data that must be conveyed each second to replicate a digital audio or video signal. Most often used with digital video, too high a data rate can result in jerky, uneven playback, especially with slower transmission media, such as older CD-ROM drives and low-end computer systems.

**decibel (dB)** - a logarithmic scale that measures the volume of a sound. If two sounds are 10dB apart in volume, it means one sound is ten times louder than the other.

**frequency** - cycles per second, also known as Hertz, an expression of the rate of change of a sound wave. The higher the frequency (the more cycles per second), the higher in pitch a sound is to our ears.

**Hertz, kiloHertz (Hz)** - named for an early researcher in audio, Hertz means "cycles per second", and is the way we express audio frequency. One Hz is one complete cycle of a sound wave per second. We perceive higher frequencies as higher pitched sounds, lower frequencies as lower pitches. Frequencies are also described in kilohertz (thousand cycles per second), as in "22 KHz". The "concert A" of modern symphony orchestras is 440 Hz.

**sample** - a single "snapshot" of an audio waveform or video signal at an instant in time. Digital audio and video are made up of a stream of samples which, when played back, approximate the original data. We talk of quantizing audio and video - the samples are the quanta.

**sampling rate** - the number of samples per second that are taken of an audio signal to produce a digitized audio file, expressed in kiloHertz (kHz). Common rates are 11.025 kHz, 22.050 kHz, and 44.100 kHz. The higher the sampling rate, the better the sound quality.

**wavelength** - the length of a single cycle of an audio signal or waveform. It is the inverse of frequency. That is, a longer wavelength represents a lower frequency; a shorter wavelength, a higher frequency.

## Uncompressed Audio

# Channels	Sampling rate (kHz)	Sample resolution (bits)	Quality Level	Data rate (kbits / sec)	Disk space needed for 10 sec file (MB)
1	5.564	8	Barely acceptable for speech - analog telephone quality.	44	
1	7.418	8	Lowest rate recommended for speech.	59	
1	11.025	8	1/4 of the standard audio CD rate, acceptable for speech, lowest recommended rate for short music segments. Low-end TV quality.	88	0.11
1	11.127	8	1/2 of the old Mac standard rate - not used much now.	88	0.11
1	<b>22.050</b>	<b>8</b>	Popular choice for CD playback, 1/2 of the standard audio CD rate. Good for speech and music. Mid-range TV quality.	<b>176</b>	<b>0.22</b>
1	22.255	8	Old Mac standard playback rate.	178	0.22
1	32.000	8	Broadcast standard.	88	0.11
1	<b>22.050</b>	<b>16</b>	Good quality for most multimedia use. Works well with both speech and wide-frequency content.	<b>302</b>	<b>0.44</b>
2	22.050	16	Stereo version of the above. Use when stereo separation is essential.	704	0.88
1	44.100	16	Mono version of CD quality. Avoid use unless excellent sound quality is necessary.	704	0.88
2	<b>44.100</b>	<b>16</b>	Full stereo CD quality. Use only when superb fidelity is required.	<b>1408</b>	<b>1.76</b>

## Uncompressed Video

Image size	Frame rate (frames per sec)	Color Depth (bits)	Data rate (Kbits / sec)	Disk space for 10 sec file (MB)
160 x 120	30	8	4608	5.7
320 x 240	15	8	9216	11.5
640 x 480	30	8	73728	92.2
640 x 480	30	24	221184	276.5