A white paper on a pitch-black topic.

How To Get Black Gold On Your Hard Drive.

Many audiophiles still consider vinyl the most "musical" sound-storage medium. But even diehard LP lovers have many—good!—reasons to digitize their black treasures. Or better yet, to have them digitized. It takes a lot of time, knowhow, hard- and software, and experience to make digitized LPs sound equal to or better than the vinyl originals. In this document, I'll discuss the elements that factor into a high-quality transfer.

Chapter 1: Who is to blame?
There's life in the old dog yet

Some examples from my archive of reproduced LP covers.

The LP refuses to die silently

The religious war of analog vs. digital was fought and decided a long time ago. Probably 99.99% of all musical productions are fully digital these days. The signal is A/D converted after the microphone preamp and is processed digitally the entire way.

This makes a lot of sense. Because most of the music is sold in digital form afterward, e.g. on CDs or as downloads via iTunes, Amazon, and others.

Only a very, very small part of total music sales is in the form of LPs. In 2011, 86.2 million CDs were sold in England—compared to only 389,000 LPs. In the US, 3.9 million LPs were sold in the same period. (Not a whole lot but still 40% more than the year before.)

Cheaper and better

Digital's triumph over analog can be explained in one word: money.

Digital gear has made it way cheaper to equip a recording studio with first-rate equipment than was the case 30 or 40 years ago. Computers are less expensive, more reliable and require far less maintenance than complex analog machines. No more costly 2" tape racing at 30 ips over the heads of touchy and equally pricey tape recorders. Digital signals can be copied and processed as many times as you like without deteriorating. Doing so with analog tape added hiss and noise and subtracted dynamics.

The worst of two worlds?

We can assume that 99.99% of all new LPs were recorded, mixed and mastered digitally. And the lacquer or metal master was cut not from analog tape but from a digital file.

From this perspective, it seems downright silly to buy new music releases on LP. Because with LPs you get the downsides of both technologies: the mechanical scanning of a vulnerable material with a crude diamond along with the sampling of a continuous signal into bits and bytes that later have to be converted into an analog signal again.

But that's just one side of the coin

It can't be denied that the LP is vulnerable and wears out. But it is also the only current physical storage medium that actually benefits from the advances in digital technology. All other storage media are either limited in bandwidth and resolution (CD), obsolete (DVD-A, SACD) or are not a proper storage medium to begin with (hi-rez downloads).

Virtually all studios record with 24-bit resolution and sampling rates of 88 kHz or higher. The highest frequencies that can be recorded are over 40 kHz, and 24 bit theoretically offer a dynamic range of 144 dB. Higher sampling rates enable the use of less aggressive digital filters.

The digital choke-hold

For CD mastering and iTunes downloads, the hi-rez signal needs to be resampled to 44.1 kHz and 16 bit. This reduces the dynamic range to 96 dB, and all signals above 22 kHz are mercilessly strangled. It's not so much the loss of the very high frequencies that causes problems but the digital stranglehold: the 22 kHz brick wall filter also influences sounds within our hearing range.

Analog and digital have complementary weaknesses. The former struggles with very loud and very low frequencies, especially if they are to be cut in stereo on vinyl. Loud bass is no problem for digital technology, whose Achilles' heel is the exact opposite—soft and high sounds—and one accentuated by the reduction to 16 bit and 44.1 kHz.

Digital master tape quality on vinyl

Good mastering engineers take end-user context into account. Vinyl records are normally played in quiet domestic surroundings on a decent hifi system. Hence, a 24/88 or 24/96 master tape is used for cutting

When mastering for CDs, they must bear in mind downloads, which tend to be played on low-fi gear and in noisier settings. Which means not only reducing resolution to 16/44.1, but also applying dynamic compression. The CD master must sound good issuing from ear plugs and iPhones. So it's no surprise that LPs often have a higher and more natural dynamic range than CDs. More about this topic on the next page.

The end is nigh…

Happily, the days of the CD as a mass recording medium are numbered. HDtracks and other sources offer new and remastered releases as downloads in 24/44, 24/88, 24/96 and even 24/192 quality for less money than a physical CD.

Furthermore, good-quality D/A converters with USB or Firewire interfaces can be had for little money. It's a walk in the park to connect a computer used as music server to a high quality stereo system. For the first time in the history of recorded music, consumers are offered a storage medium that can deliver the same quality at home as it does in the recording studio.

A first wrap-up

The future belongs to music servers and hi-rez downloads. It does however make sense to digitize new LP releases if no hi-rez downloads are available. But this is probably rather the exception than the rule. More about this in the next chapter.

Inter-mezzo:

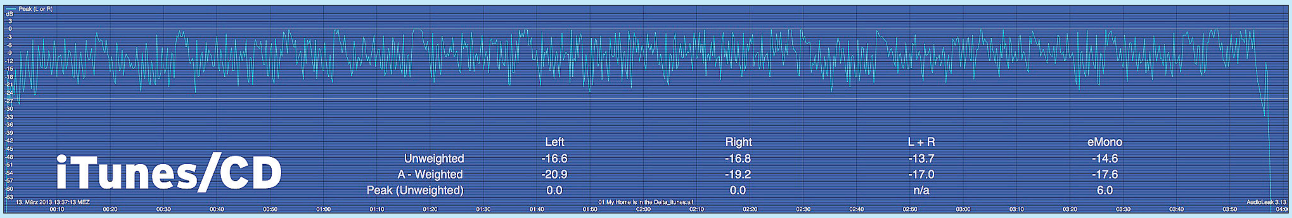
Muddy and the loudness war

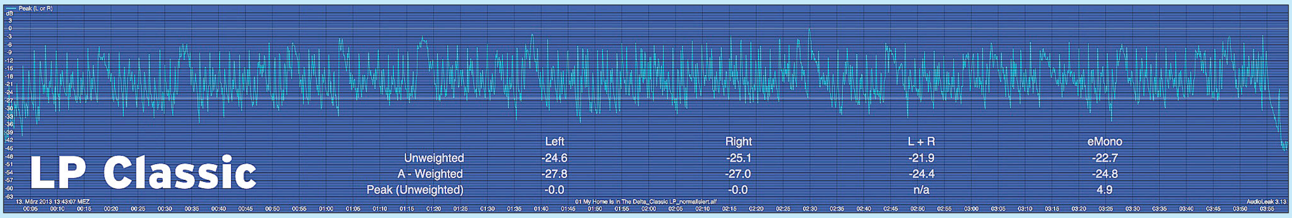
Muddy Waters' 1964 album *Folk Singer* is a classic—both in terms of musical and recording quality. For our comparison I have ripped and recorded the track "My Home Is In The Delta" (A/1) from different media. To make the comparison valid, all files were peak normalized to 0 dBFS. In this case, normalization is permitted since the track has the highest peaks on all compared media.

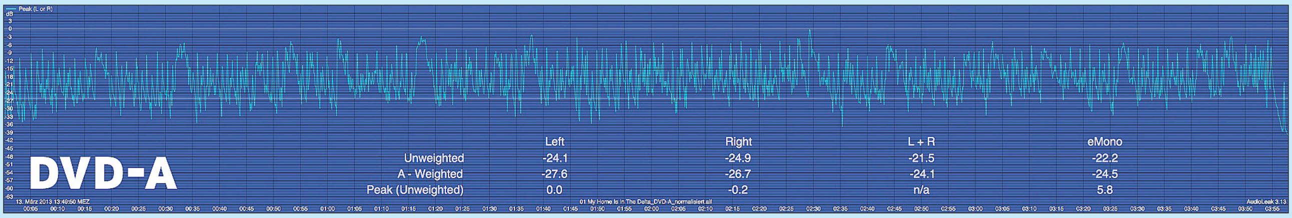
The numbers in the graph relate to LEQ (Equivalent Continuous Level). LEQ is used in broadcast to determine the average loudness. The greater the difference between Peak and eMono (A-weighted), the larger the dynamic range between soft and loud passages.

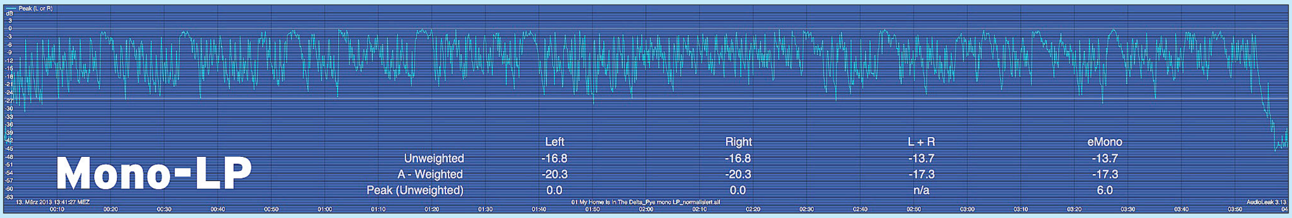
The AAC file was downloaded from iTunes. It is the same mix as on the CD. The broad flattened peaks indicate heavy signal compression. (It's similar to the mono LP from the early 1960s, although compression was used a little less shamelessly in those days.) The two releases from Classic Records on LP and DVD-A offer exemplary wide-range dynamics; they were mastered without compression from the original master tapes. A bit of compression was used for the SACD and the MFSL LP mastering.

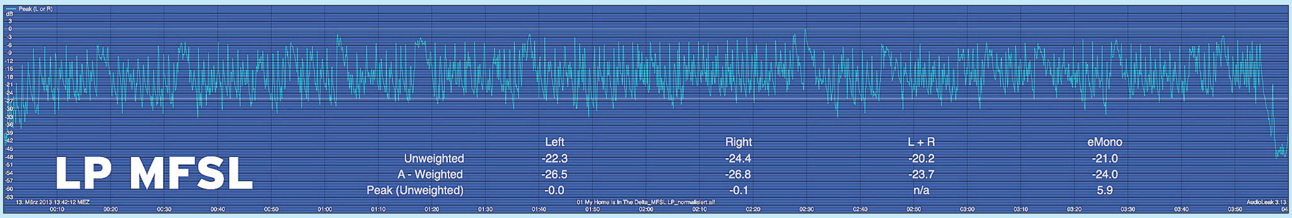
Upshot: the Classic Records LP shows the widest dynamics, closely followed by Classic's DVD-A. Both show around 8 dB more dynamic range than the CD/iTunes version. Can you really content yourself with such lousy (and lossy) quality?

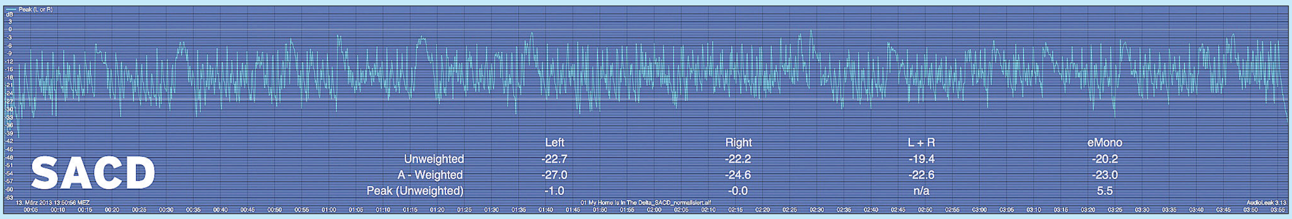












Chapter 2: Why actually?
Good reasons for digitizing LPs

Are you interested in digitizing your LPs? If so, you probably care more about getting a digital facsimile of your old treasures than of newly released LPs, and there are plenty of good reasons to do so:

- **Preservation.** You want to go easy on your valuable first pressings, direct cuts and other collector's items. A perfectly valid reason, since each playing of an LP leaves microscopically small traces. These accumulate over time and gradually your LP will start to tick and crackle audibly. By digitizing your LPs early (and properly), you can have your cake and eat it too—you'll keep your LP in near mint condition even while spinning it daily (on your music server, that is).

- **Restoration.** Wish you could hear your favorite LPs without those annoying snap, crackle and pops? Software can remove or at least attenuate these defects with surgical precision (and no bloodshed). This is why digitized LPs can sound better from your music server than from your turntable.

- **Quality/Convenience.** Digitizing LPs allows you to combine the dynamic range of analog with the convenience of digital. Enjoy Maria Callas' "Rigoletto" in pristine mono without having to get up and flip records or being restricted to the inferior sound quality of the CD reissue.

- **Portability.** Want to enjoy your favorite LPs not only at home but in your car or at work (through headphones)? LPs and turntables are not exactly mobile. With an iPad and an external D/A converter you can listen to your digitized LPs on the road in 24/96 resolution.

- **Space.** You discarded your turntable a long time ago, but still cling to your record collection for sentimental reasons? Good. Even though many LPs (especially of known artists) have been reissued on CD, the sound quality often leaves a lot to be desired due to the loudness war (see previous page). And of course there are plenty of recordings by obscure artists that have never been reissued on disc. Digitize and discard!

There are many good reasons for digitizing your LPs, but doing so involves a lot of effort. So it pays to do it right. I'll describe what I consider "right" in the following chapters.

Chapter 3: How then?
The intricacies of digitizing LPs

Analog recording technology in general and the LP in particular have undeniable virtues. They also have some quirks and peculiarities that need to be dealt with. The issues, in no particular order, are:

1. How to track?

Record companies really should have chosen a more forgiving material than vinyl. But they didn't. Vinyl forgives nothing, especially not neglect or ill treatment. LPs, if grabbed with greasy fingers, allowed to collect dust on exposed platters, played with dirty or worn stylii, put into rough paper sleeves, or slipped nude into scratchy covers, retaliate with clicks, pops, hisses and other noises.

Digitizing LPs is an archival process. In my opinion, there is no need to document the fallibilities of vinyl, or for that matter subsonic rumble and tonearm resonances.

For archival purposes, LPs first and foremost have to be as clean as possible. They should be tracked by an equally clean stylus whose shape and polish does not emphasize any wear the vinyl may have suffered. And they shouldn't be played on a cheapo turntable with an integrated USB interface, but instead on the best deck available whose tonearm and cartridge match.

Many modern high-end cartridges highlight detail. It's too bad they can't differentiate between musical and non-musical tics and pops. "Acoustical loupe" cartridges are not suited for archiving because they cause more work—and subsequent damage—in click removal. I therefore use Magic Diamond cartridges. They are known for their smoothness and seem able to distinguish between musical information and vinyl defects better than other cartridges.

Mono pressings can be played with stereo cartridges. However, mono grooves contain only lateral information, whereas stereo cartridges are also sensitive to vertical information. Vertical information on mono LPs consists only of clicks and pops and groove noise that later have to be filtered out. I therefore use a Magic Diamond mono cartridge for digitizing mono LPs.

2. To normalize or not to normalize?

The loudness of a track should be the result solely of musical decisions during the recording. Sadly, this is not the case. In popular music especially, engineers use compression more and more freely. They reduce the dynamic range of recordings to a few measly decibels simply to make the song louder. This is easily heard on CDs reissues; the original releases frequently have more dynamic range than the later reissues.

Loudness on LPs is affected by technical matters. The smaller a record's groove radius, the more difficult it is for cartridges to track loud passages cleanly.

This is due to tonearm geometry, stylus shape and the relative speed of the vinyl passing under the stylus. Since the turntable spins the LP at a (hopefully) steady 33.33 RPM, the distance the stylus covers in 1 second is greater in the outer than in the inner grooves of an LP. Hence, when cutting the lacquer, the same amount of musical information needs to be fitted on a smaller surface toward the end of the LP side.

To add insult to injury, especially in classical music, the crescendo, in which the orchestra blasts away fortissimo, nearly always comes at the end of an LP side. Since engineers can't have both loudness and low distortion in the inner grooves, they trade distortion for decibels. Were they to keep the gain the same over the entire LP side, quiet passages at the beginning of a piece/side might drown in tape hiss and groove noise. So gain rides to the rescue: the level is lowered continuously from beginning to end. This reduction needn't be audible but shows up in an LEQ analysis. One can theoretically normalize these loudness differences in the digital domain over the two LP sides. In jazz and pop music, one can even normalize each track to the same peak or average level. However, I consider digitizing LPs an archival, not a remastering process; therefore, I refrain from such manipulation and record both sides of an LP at the same level.

3. What about those 30-second fadeouts?

LPs are noisy. Some more so, some less so, depending on the pressing, the quality of the vinyl, and the condition of it. Analog technology allows details to be heard even if they are buried in the noise floor. Especially on older vinyl from the 1960s and 1970s, one finds fadeouts as long as one's arm. They are so extended and subtle they just can't be reproduced with 16 bit as they would be drowned in the non-linearities of the A/D and D/A converters.

Because I digitize with 24 bit, I try to preserve the original analog fadeouts as much as possible (see pages 17/18). On worn LPs the noise occasionally gets louder than the signal. In that case I put in a new, shorter fadeout that preserves the characteristics of the original. This results in a harmonic fadeout without the disturbing groove and surface noise.

4. What about tags?

Music servers are computers that operate a database and play audio files linked to it. The more files the database contains, the more important the embedded metadata (a.k.a. tags) becomes. Without tags the individual files wouldn't have titles, the names of artists and composers, track numbers, publishing information, etc. In short: a database without metadata is useless. Tagging is time-consuming and often involves research. It is, however, crucial to archival work.

LP covers are also an issue here. iTunes and other music server software display covers and allow the user to browse through the collection as if they were standing in front of a record shelf. There are online databases for covers. Sadly, they often display the wrong one. You can of course try to find the cover artwork via Google, though experience indicates that it will often be pixilated, unfocused or distorted. There are almost no scanners that can reproduce an LP cover in a single go. I therefore reproduce covers photographically with a digital reflex camera equipped with a macro lens and mounted on a tripod. It is important that the sensor surface and LP cover are perfectly parallel. A gray card placed next to the cover helps me to adjust the white balance and tone range in Photoshop closely to the original artwork. Small blemishes are also corrected in Photoshop. The file is then reduced to a 1000x1000 pixel JPG embedded in the digital audio files so that it shows up automatically in iTunes and other music server software.

Chapter 4: All will be good.
How to digitize LPs, step by step

Fig. 1 (top): The gray card left of the cover allows correct adjustment of white balance and tonal range in Photoshop.

Fig. 2 (left): The VinylCleaner cleanses LPs with ultrasonic bubbles and micro fibers. The LPs are dried by air which introduces no static charge.

Step 1: Cleaning and reproducing

Cleanliness being next to godliness is not just a tired adage when it comes to noise-free LP playback. I use a machine from Audiodesksysteme Gläss that cleans LPs in a water bath with ultrasonic bubbles and rotating micro fiber rolls. Even more important, it blows the water off the surface instead of vacuuming it off for a thoroughly clean LP with no static charge—essential for click-free playback.

The freshly cleaned LP is put in a pristine premium inner sleeve. The old sleeve is discarded (if plain) or kept in the cover (if printed). During the cleaning the cover is reproduced and processed.

Fig. 3: For digitizing, LPs are spun on a EMT 930 studio turntable. The 12" arm in the back supports a mono cartridge; the stereo cartridge is mounted to the 10" arm (right). The monitor shows the PureVinyl software used for digitizing the phono signal.

Step 2: Digitizing

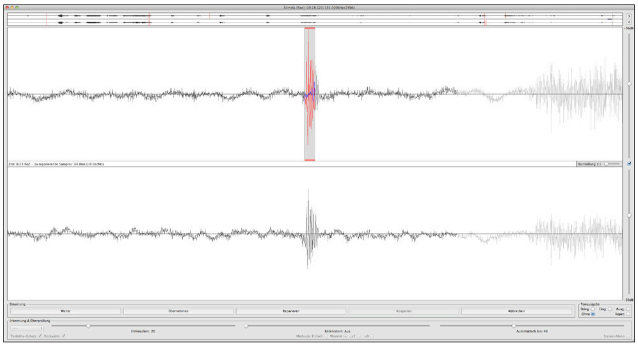
The clean LPs are spun on a revised EMT 930, a studio turntable from 1971. For stereo LPs, a Magic Diamond MC cartridge is used on a 10" Fidelity Research FR-64S arm. Mono LPs are tracked with a Magic Diamond mono moving coil mounted on a 12" Ortofon RMG-309i.

Both arms feed the microphone preamps of a Metric Halo ULN-8 via Silvercore and Jensen step-up transformers. The ULN-8 is an eight-channel A/D and D/A interface that enjoys a great reputation among studio pros for its quiet, transparent and distortion-free amplification and conversion.

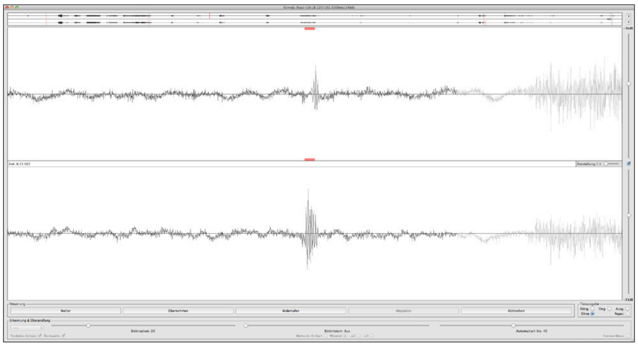
The signal is digitized "dry," i.e. without prior RIAA EQ, at a sampling rate of 192 kHz and 24 bit resolution. Digitizing the un-EQ'd phono signal means that the highest frequencies are almost 40 dB louder than the lowest. This taxes the headroom of the mic preamp and requires it to be noise free (which the ULN-8 is). It is definitely not recommended to record a dry phono signal with 16-bit resolution.

Digitizing a "dry" signal has two big advantages. First, it is much easier to remove clicks and pops from an un-EQ'd signal. Second, the RIAA-EQ done in software is so much more precise than using reactive passive components such as resistors, inductors and capacitors that will change their values over time.

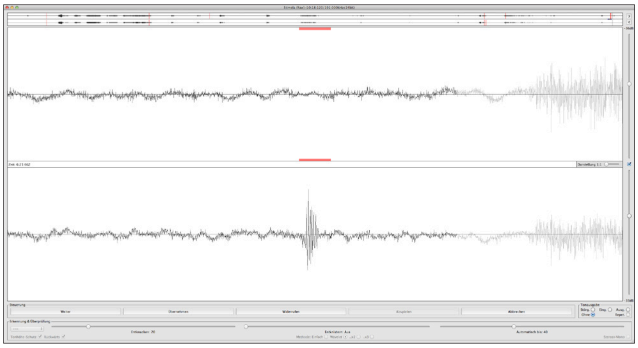
It is imperative not to ever clip the A/D converter when recording the LP. I try to keep the highest peaks of music and tics at around -1 dBFS.



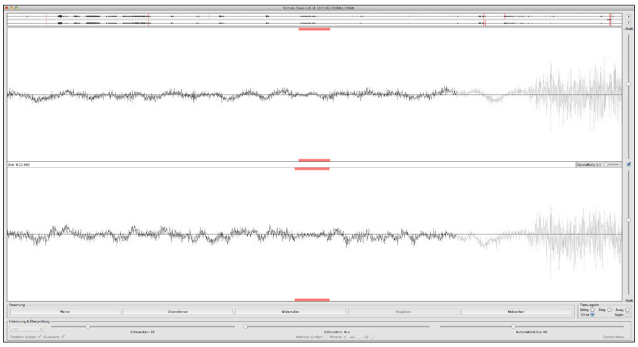
The software has identified a tick of 84 samples length (red) and suggests a repair (blue).



ClickRepair's suggestion removes only part of the tick.



Only with manual interpolation can the defect in the left (upper) channel be removed entirely.



The tick in the right channel receives the same manual treatment. This results in a complete and inaudible removal of the defect. For the record: 84 samples at 192 kHz sampling rate correspond to exactly 0.0004375 seconds…

Fig. 4: Removal of clicks with ClickRepair.

Step 3: Removal of clicks and pops

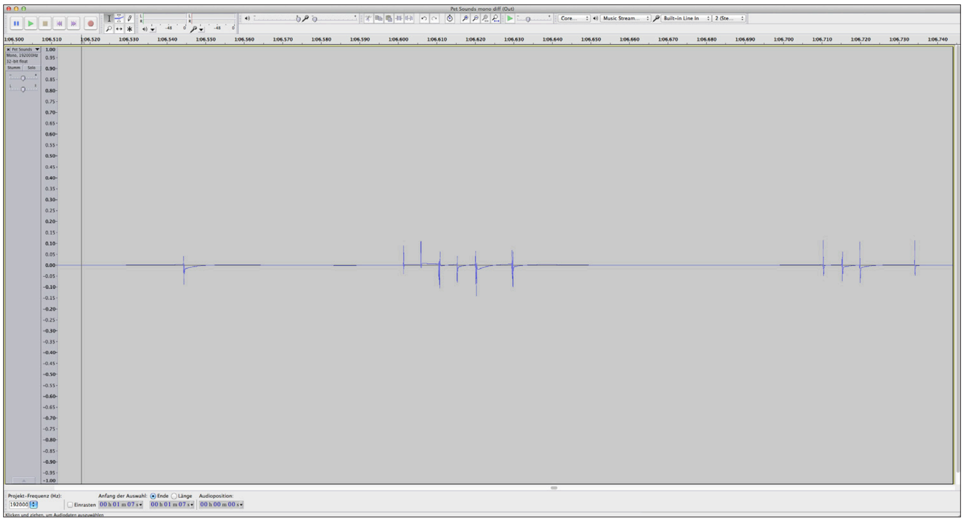
A controversial topic. Clicks are removed by interpolation, which invariably also removes tiny bits of music.

I have been using ClickRepair for years with good success. This software manages the balancing act very well and can be adjusted to lose virtually no musical information.

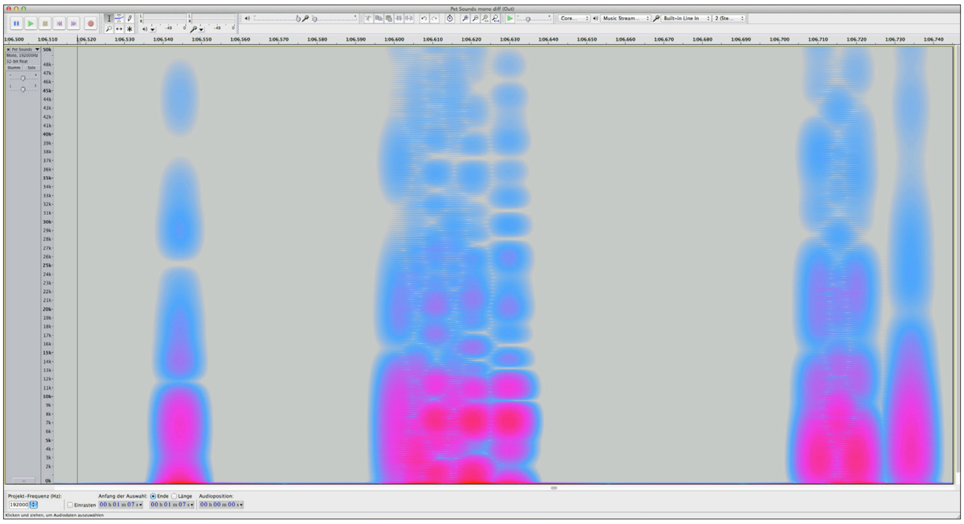
ClickRepair uses wavelet-based algorithms to detect surface defects. I usually adjust ClickRepair to automatically remove all blemishes shorter than 40 samples duration. When sampling at 192 kHz, 40 samples correspond to 0.0002 seconds. If ClickRepair detects a defect of more than 40 samples duration, I inspect the defect and—if neccessary—manually adjust the repair.

I often use a differential signal ("null signal") to control ClickRepair's work on well-worn LPs. I take the same channel (left or right) of both, the untreated and the treated audio file. I copy them to two tracks in a new file and reverse the signal polarity of one track, i.e. the untreated track has correct signal polarity, the treated track has the signal polarity reversed 180°. Now both tracks are mixed down to one mono track. This cancels all information present on both tracks but opposite in phase. What remains is the difference between the two tracks, i.e. everything that has been removed or changed by ClickRepair. Ideally this is only tics and noise.

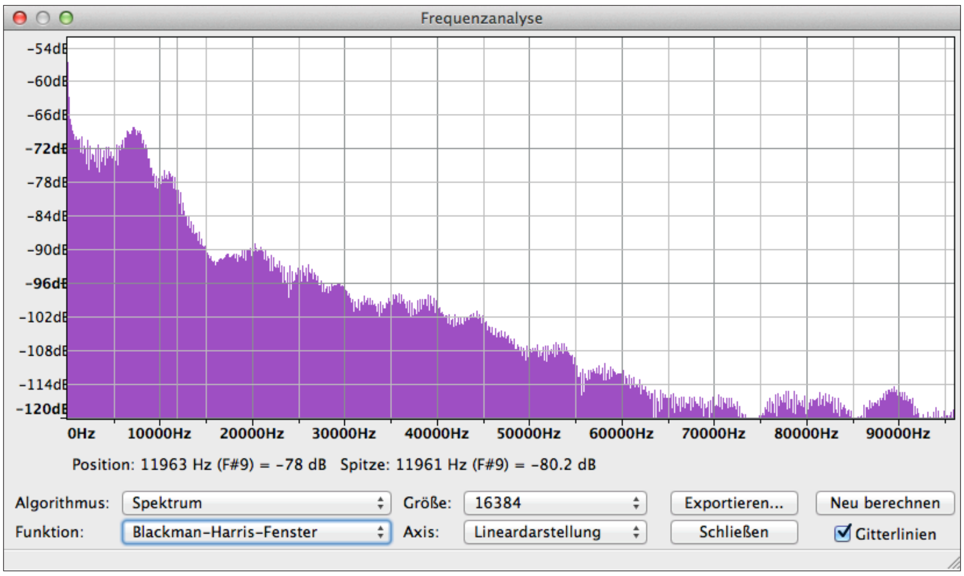
If the differential signal sounds remotely like music (especially if any rhythm can be heard), the correction was too aggressive. In that case I run the untreated file a second time through ClickRepair, but with a weaker setting. When in doubt, I would rather not remove a click than remove music.



Approximately 0.2 seconds of a differential (null) signal before and after ClickRepair. The picture shows the typical, apparently harmless needle impulses of clicks and other defects.



The spectrogram proves that the clicks are not harmless but instead have surprisingly great high frequency energy up to 50 kHz.



This is confirmed by the frequency analysis showing, albeit at an extremely low level, frequencies up to 90 kHz (close to the Nyquist frequency of 192 kHz sampling rate).

Fig. 5: Differential (null) signal analysis

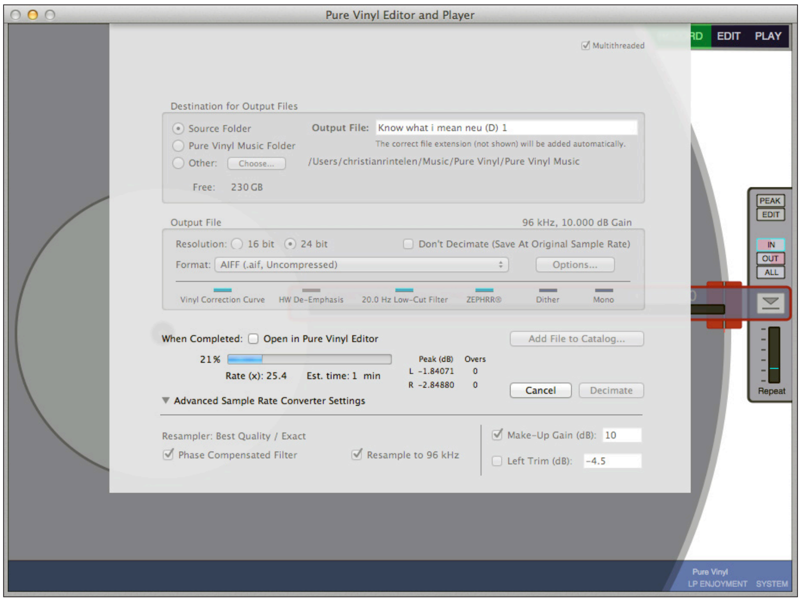


Fig. 6: I use an older version of PureVinyl for RIAA EQ, subsonic filtering and resampling to 96 kHz because offline editing is no longer supported by the newer versions. Even with a fast computer and plenty of RAM it still takes around three to five minutes to process a 192 kHz file…

Step 4: RIAA-EQ and resampling

PureVinyl software applies the RIAA EQ with 64-bit math. It's hard to be more precise, and it certainly doesn't make any sense to be since the RIAA preemphasis while cutting certainly has higher tolerance than <0.02 dB…

During the two-step process of RIAA EQ, PureVinyl also applies a steep subsonic filter eliminating all frequencies below 20 Hz with 96 dB/octave. This cleans up the bass remarkably and prevents the woofers from senselessly pumping air caused by record warp, turntable rumble and tonearm resonances (which burns up amp power uselessly, creates a lot of IM distortion, sounds bad, and fries the voice coils).

PureVinyl offers a list of label-specific EQ curves for records from the time before all labels agreed (and adhered) to a common preemphasis standard (the RIAA). Of course I am happy to use these curves when digitizing very old LPs. The difference between RIAA and correct EQ is sometimes far from insignificant…

While applying EQ and subsonic filtering, I also have PureVinyl resample the 192 kHz recording to 96 kHz. I have spent a lot of time trying to discern an audible difference between 192 kHz and 96 kHz playback sampling rates. But to my ears and on my systems they sound identical.

However, 192 kHz recordings take up twice as much disc space (around 2.6 GB per LP). To save space I have thus decided to store my digitized LPs at 24 bit and 96 kHz. According to Nyquist this gives an upper frequency range of 48 kHz.

I know of no tweeter able to reproduce such high frequencies. I know of no LPs that contain relevant musical information of such high frequency. And I certainly know of no audiophile with ears capable of hearing such high frequencies. (The picture is different for CD, where all frequencies above 22 kHz are cut off with no mercy. A digital filter for 48 kHz can be less steep and less aggressive, which is certainly less harmful.)

Should you insist on 192 kHz, I will of course comply and save your digitized LPs at the original recording sampling rate. By request I will supply an additional set of files dithered and resampled to 16 bit/44.1 kHz and/or lossy MP3 or AAC files for your mobile devices.

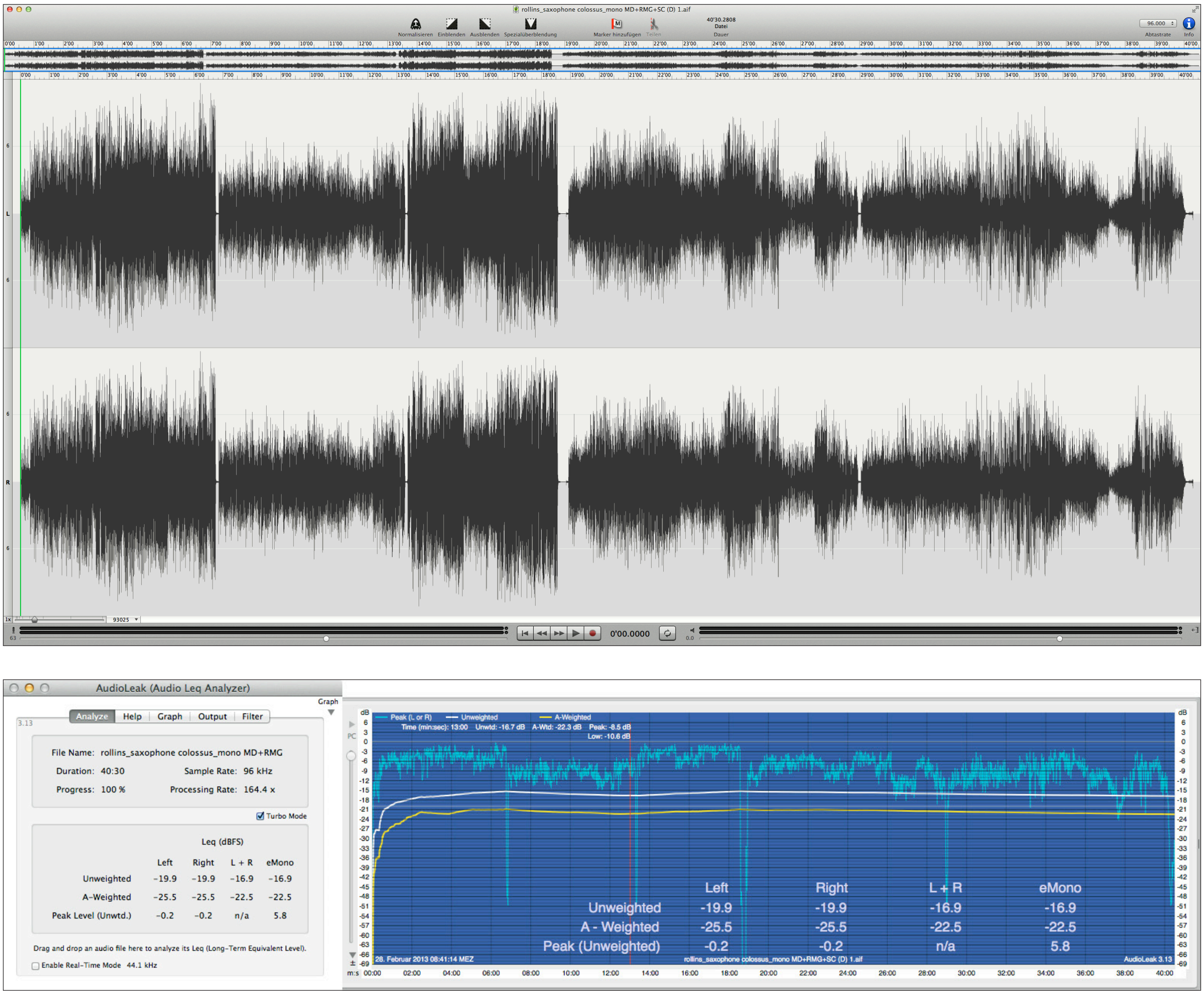


Fig. 7: Both sides of a mono LP, RIAA EQ'd and resampled to 24 bit/96 kHz. The upper picture shows the wide dynamic range of this recording (DCC reedition of Sonny Rollins' *Saxophone Colossus*). From the lower picture we can see that the average loudness of the two LP sides is 25 dB below the peak signal (A-weighted, yellow line). This example was digitized rather hot with the peak reaching -0.2 dBFS. For resampling to 16/44.1, I would lower the level to -0.5 dBFS to make sure the D/A converters do not clip on replay.

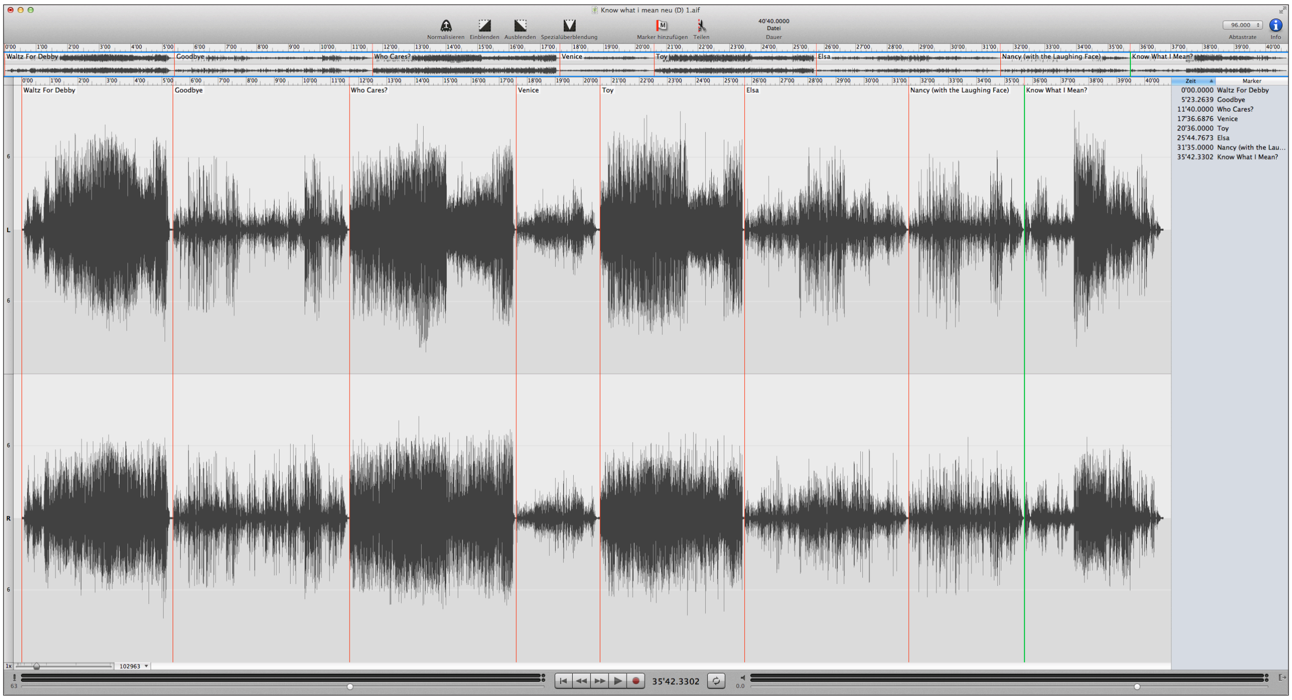


Fig. 8: Both sides of a normal LP with the track marks and track titles added. The picture clearly shows the differences in loudness of the individual tracks. It also shows that the producer selected a quiet track at the end of side 1. The last track on side 2 also gets quieter toward the end. By arranging records this way, engineers in the 1960s tried to reduce the inevitably higher tracking and tracing distortions at the end of an LP side.

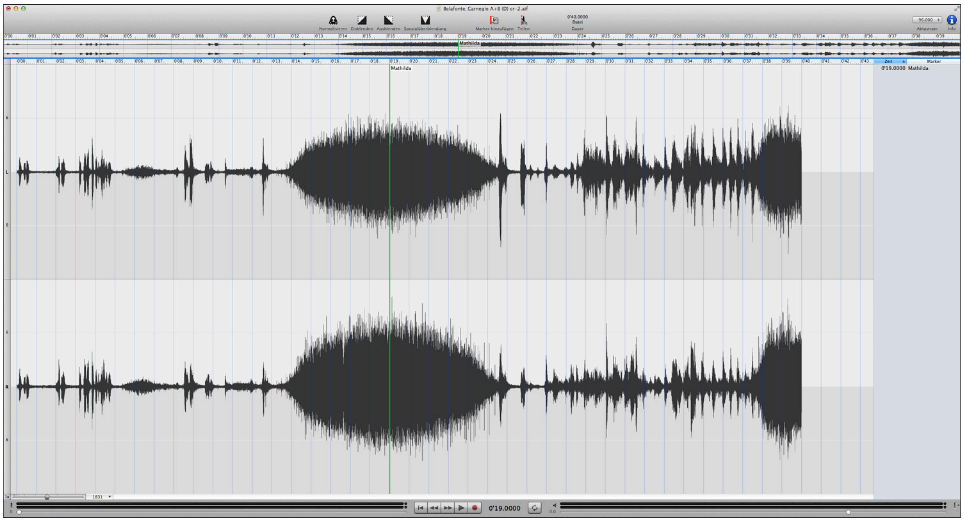
Step 5: Cutting and tagging (part 1)

I use the editing software SoundStudio to open the file weighing in at approximately 1.2 GB, put markers between the individual tracks and insert the track titles. On normal studio recordings such as in Fig. 8, finding the pause between two tracks is easy.

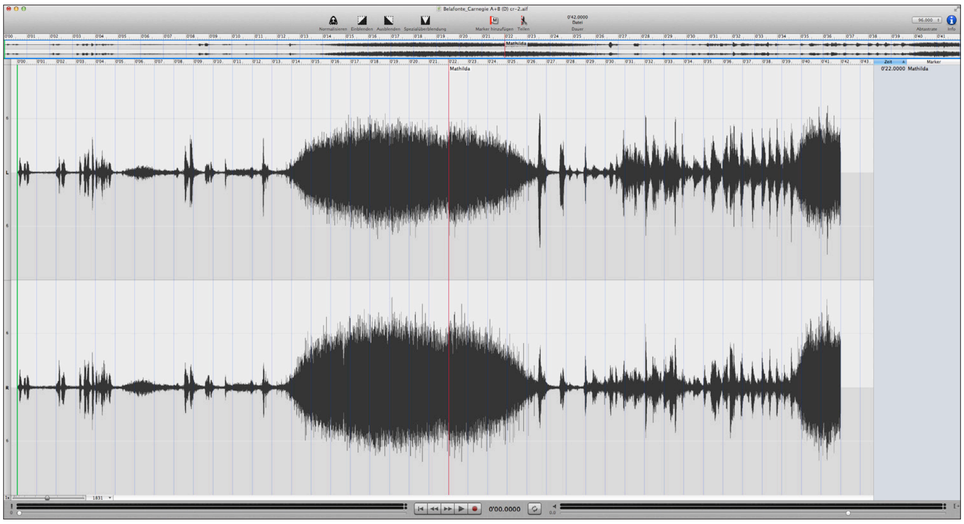
Things get more complicated when digitizing live albums where two tracks are separated by applause (see Fig. 9 on the next page). In that case you have two options—hard cuts or short fades.

- **Hard cuts** are recommended when you listen mostly to entire albums and if your music server software offers a function such as “gapless playback.” In this case the playback will sound exactly as if you’d play the LP while offering the benefit of direct access to individual tracks.
- **Duplicating:** If you often use playlists with music from different albums, hard cuts will appear to be inharmonious. In that case I duplicate a short duration of applause, cut in the middle to add fades later.

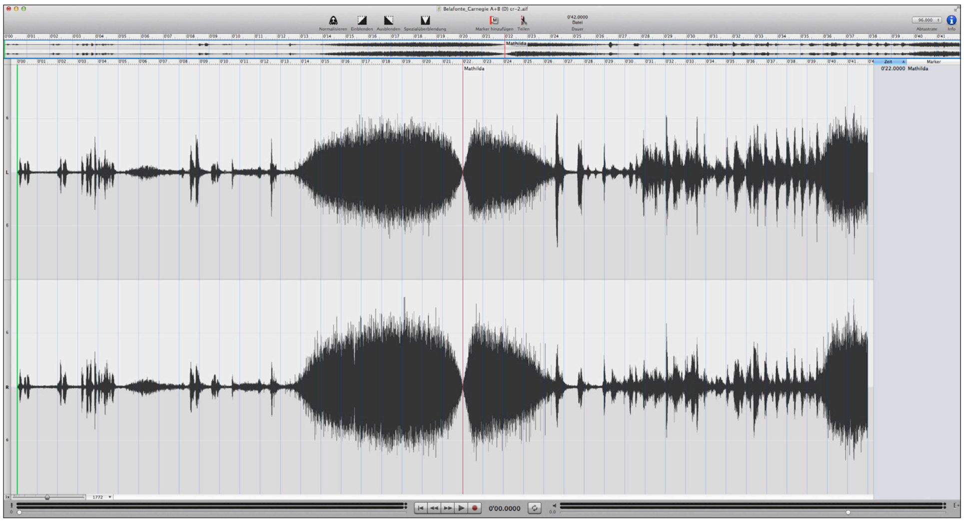
SoundStudio then splits up the file at the markers and saves the individual tracks with consecutive numbers.



The typical applause between two tracks of a live recording (Harry Belafonte's *Carnegie Hall* concert). A hard cut separates the two tracks in the middle of the applause—well suited for gapless playback.



Duplicating for soft fades between two tracks. The picture shows that two seconds to the right of the red marker were copied and inserted to the left of the marker.



The applause before the cut receives a harmonious two second fade-out. The fade-in of the next track lasts only half a second. This method ensures that no information is lost (as would occur with fades and no duplication), and the two tracks sound more harmonious when mixed with tracks from other albums in a playlist.

Fig. 9: Hard cuts vs. duplicating when digitizing live LPs

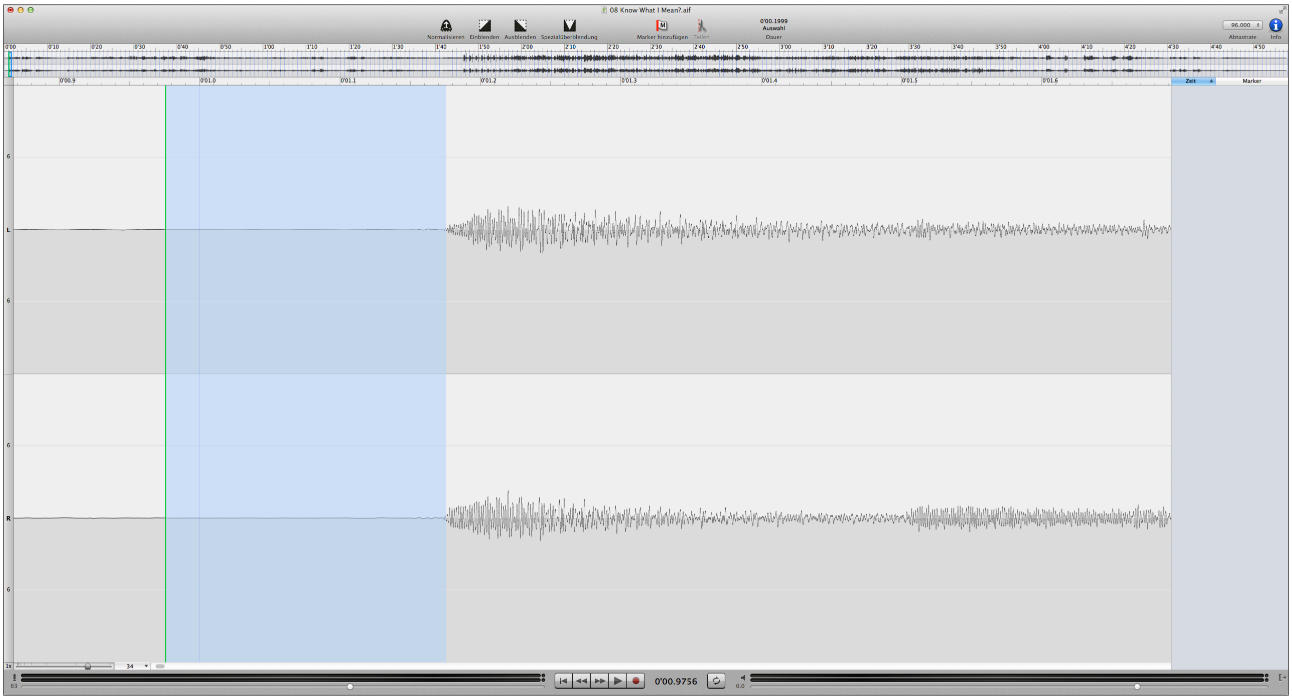


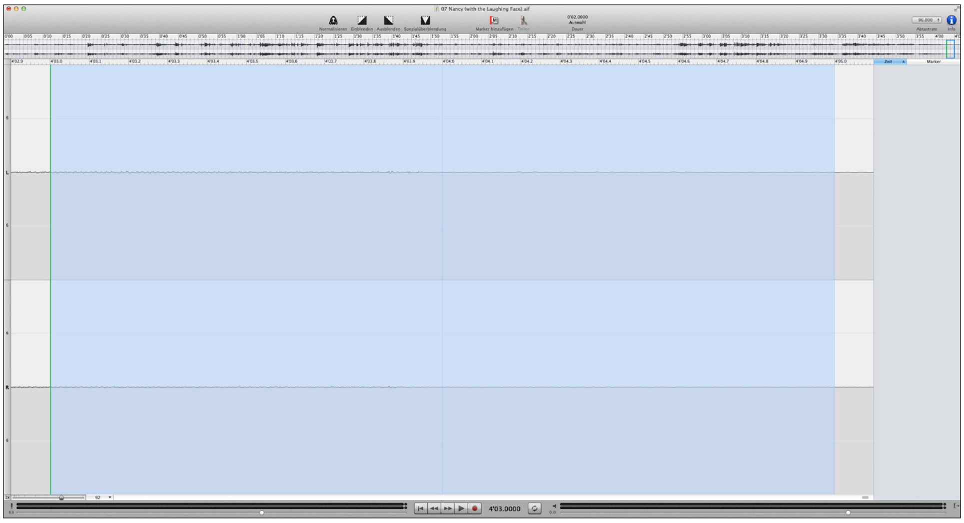
Fig. 10: Normal fade-in within 0.2 seconds of the first sound (blue highlight). The file is then cropped at the left margin of the highlighted area.

Step 6: Polishing and tagging (part 2)

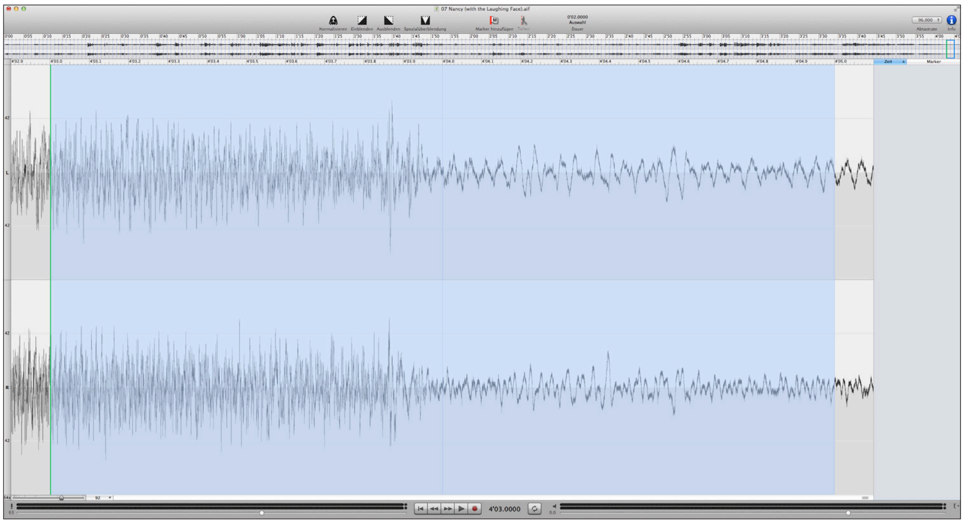
Each track file is now opened in SoundStudio to crop the track to the actual length, to apply the fades and to complete the metadata.

The magnified view of the waveform clearly shows where the first sounds of a track start. I go back 0.2 seconds from this point, crop the entry and apply a fade-in. At the end of the track I search for the last audible sounds, apply a fade to the next full second and crop the exit.

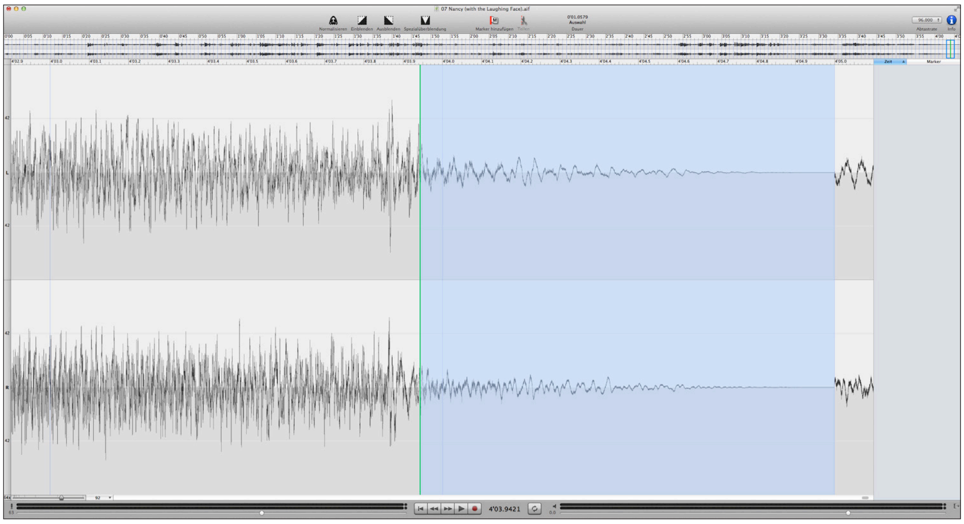
Now I listen to the track on headphones and remove the remaining clicks manually. To finish the work, I complete the metadata (composer, artists, release year, etc. according to the information on the label and on the cover), embed the JPG of the cover and save the track as an AIFF file.



A typical analog fade-out into the surface noise. The zone highlighted blue lasts two seconds. With the naked eye it is impossible to see where the fade-out stops and the blank between two tracks begins.

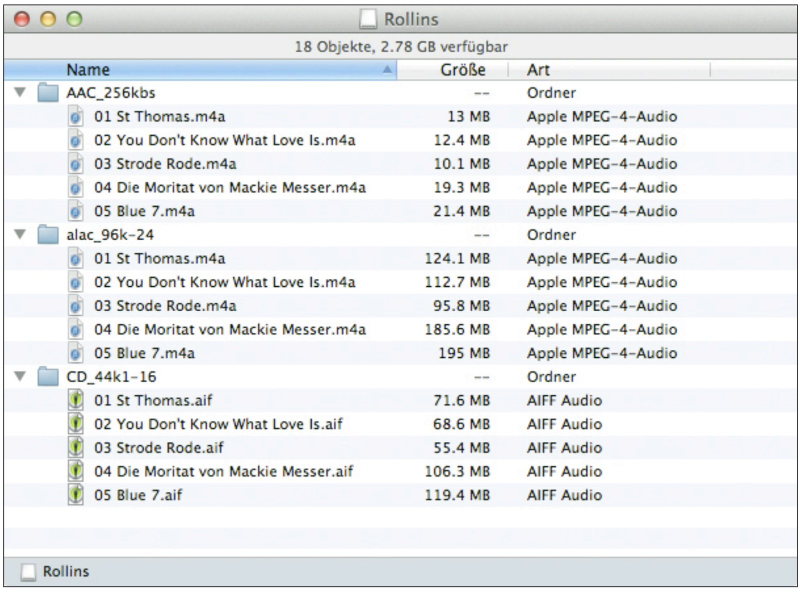


Enlarging the amplitude 64 times clearly shows the end of modulation and the beginning of the blank.



This is where I apply a fade-out to the second full-second mark (the first would have been only 0.06 seconds away).

Fig. 11: Fade-out into the surface noise



Rollins

18 Objekte, 2.78 GB verfügbar

Name	Größe	Art
AAC_256kbs	--	Ordner
01 St Thomas.m4a	13 MB	Apple MPEG-4-Audio
02 You Don't Know What Love Is.m4a	12.4 MB	Apple MPEG-4-Audio
03 Strode Rode.m4a	10.1 MB	Apple MPEG-4-Audio
04 Die Moritat von Mackie Messer.m4a	19.3 MB	Apple MPEG-4-Audio
05 Blue 7.m4a	21.4 MB	Apple MPEG-4-Audio
alac_96k-24	--	Ordner
01 St Thomas.m4a	124.1 MB	Apple MPEG-4-Audio
02 You Don't Know What Love Is.m4a	112.7 MB	Apple MPEG-4-Audio
03 Strode Rode.m4a	95.8 MB	Apple MPEG-4-Audio
04 Die Moritat von Mackie Messer.m4a	185.6 MB	Apple MPEG-4-Audio
05 Blue 7.m4a	195 MB	Apple MPEG-4-Audio
CD_44k1-16	--	Ordner
01 St Thomas.aif	71.6 MB	AIFF Audio
02 You Don't Know What Love Is.aif	68.6 MB	AIFF Audio
03 Strode Rode.aif	55.4 MB	AIFF Audio
04 Die Moritat von Mackie Messer.aif	106.3 MB	AIFF Audio
05 Blue 7.aif	119.4 MB	AIFF Audio

Rollins

Fig 12: I will carefully pack your LPs and return them to you with a USB stick containing the specified formats. In this example: High-resolution 24/96 Apple Lossless (ALAC), a set for the CD burner (16/44.1 AIF) and a set for mobile use (AAC with 256 kbs). The stick is yours, and in case of data loss I keep a copy of your files on my backup server.

Step 7: Saving and compressing

Depending on the software requirements of your music server, I now save the track files as WAV, AIFF or in a lossless format on a USB stick. On request and with no surcharge I also save a dithered 16/44.1 version and/or MP3 or AAC files with 256 kbs for mobile use.

Speaking of lossless: FLAC (Free Lossless Audio Codec) and ALAC (Apple Lossless Audio Codec) are two losslessly compressed formats resulting in files approximately 30-50% smaller than the original wav/aif file. Lossless audio can be compared to zipping office files that will be unpacked by the computer bit perfectly and rendered identical to the originals. For the same reason there is no sonic difference among AIFF, WAV, FLAC and ALAC—provided the music server unpacks and loads the data into the RAM prior to playback.

Some music servers play the audio files directly off the hard disk. In this case, a small difference may be audible if the unpacking does not happen before but during replay.

Good music server software can be set to play the files from RAM only (PureMusic, e.g., calls this function “memory play”) or does so by default.

In my opinion, Apple’s iTunes is good software for managing music files, though there are better applications for replaying hi-rez files such as PureMusic.

Chapter 5: What now?

Are you interested? The next steps

Have you actually read the entire document or did you jump directly to the end? It doesn't matter, because obviously you are interested in having me digitize your LPs! In that case, I recommend you first select the ones you really want in bits and bytes. If not, things can get expensive quickly.

I charge a flat fee of CHF 50 plus VAT for single LPs; double LPs are CHF 75. Included in this fee is everything covered in steps 1 through 7 plus postage within Switzerland (registered mail, priority). There is a volume discount for 10 LPs or more. Please ask for a quote for boxes with three or more LPs. If you live outside Switzerland, there will be no VAT but I will charge the actual shipping costs.

You don't want to buy a pig in a poke? Good. In that case I'll digitize your LP and put two two-minute samples from each side on a password-protected server for download. This test costs CHF 20. You will be credited this amount if you're not happy with my work or if you give me the thumbs up for the rest.

In addition to the LP I need the following information from you:

- Resolution and sampling rate (default is recording at 24 bit/192 kHz resampled to 24 bit/96 kHz)
- File format (AIFF, WAV, FLAC, Apple Lossless)
- Additional file formats (e.g. CD format 16 bit/44.1 kHz, MP3 or AAC)
- For Live-LPs: type of track separation (hard cuts for gapless playback, soft fades with/without duplication of applause)
- Loudness (standard: identical recording level for both sides of LP; option: normalizing individual tracks either to peak -0.5 dBFS or to the same average level)

Do you need further information or do you have any questions? I look forward to receive your mail

christian@rintelen.ch

