Tranferring LPs to CD

Transferring LPs to CD made easy (original article by Philip Harland)

INTRO

You can greatly enlarge your music library for very little cost if you get back into vinyl like I did. I've been transferring LP records to digital for about eight years. If you arrange a very good set-up and take care with your transfers, you can end up with digitized music that sounds just as good as (if not better than) your typical bought CD. My main stereo includes used Paradigm Studio Reference 100 speakers and a very good amplifier (used Bryston DAC/preamp and amp), which is quite revealing if there are any weaknesses in the transfers. I have largely eliminated weaknesses with my current set-up and process.

I'll begin by outlining the key elements in transferring and then also link to several other sites that provide further information. I don't want to reinvent the wheel here, but I do want to note what I've found to work best.

THE EQUIPMENT AND THE PROCESS

Here is what you need (with some of my comments on each):

A very good turntable

- I use a direct drive Technics SL-1200MK2 (which you can buy new for about $600 or used for about $200). Direct-drive turntables, distinguished from belt-drive, maintain a steady playing speed and prevent what they call wow and flutter (arbitrary speeding up and slowing down). Some audiophiles prefer belt-drives nonetheless, and belt-drives are the most common. (I also have a vintage Dual 1229 turntable in the basement, which would have worked fine but not as well as the Technics). Another more recent option is to buy a turntable with a USB out specifically designed for transferring (and often with in-built phono preamp). Since such turntables are quite cheap, they are not likely to produce the quality of sound of the set-up I suggest here. But they may well be good enough for your purposes.
- Most turntables will have two RCA connectors (red and white) which plug into the phono input of your amp and a ground wire. It is absolutely essential that you attach that ground wire to the ground connector on the back of your amplifier/receiver (or ground it in some other way), otherwise you will have a loud constant hum from the turntable.

An excellent turntable cartridge and needle / stylus

- I did quite a bit of research on what cartridge and needle provided excellent sound without costing an arm and a leg. At first I ended up with the Audio Technica AT 440MLa (MM), which has what they call an eliptical stylus/needle and which you can buy online for about $100 (list

price is about $300). As of 2010, I have upgraded to the AT 150MLX (similar design to the 440MLa but better), which does make quite a difference in conjunction with a better phono preamp. That one costs quite a bit more, though.
- There are two main formats of cartridge: 1/2″ mount and P-Mount. Good turntables generally use 1/2″ mount. There are two main kinds of cartridge-needle combinations: MM (moving magnet) and MC (moving coil). MC cartridges are “low output” and sometimes require additional set-up requirements and equipment, but if set up properly can provide a lower noise floor (quieter background noise from the record-playing). Nonetheless, a good MM can provide excellent sound and is less complicated in making sure it all works out (I’m told a badly set up MC can sound horrible). A new cartridge and needle needs to be “broken in” for a good number of hours before it hits its peak in sound quality.
- It is important that you make all of the necessarily adjustments when hooking up the cartridge, including the weight counter-balance, anti-skate setting, and cartridge alignment (on which go here for some free tools including a protractor). You also want to make sure that the tonearm is parallel with the record surface, which is also known as setting the VTA (vertical tracking angle).

A very good amplifier or receiver with proper “Phono” input (and phono pre-amplifier)

- By “very good” I mean mid-range priced amps by the likes of NAD, Yamaha, or Denon. You must have a proper “phono” input on your amp or receiver since the sound-signal from a turntable needs extra amplification (a built-in “preamp” as they call it). If you have a good amp already but it doesn’t have a phono input, you can buy a separate turntable preamp. At first, I picked up a used NAD 7155 (from the 1980s) for just $20, which has a good turntable preamp or “soundstage” and also happened to have the ability to switch between MC and MM cartridges. When buying a used amp, you may need to buy a spray bottle of cleaner from Radio Shack to clean the inside of the volume and other nobs (if there is initially static). In 2010, I have acquired a used Bryston BP 0.5b (basically the same as a Bryston BP 1), which is a standalone phono preamp with volume control. This has made a significant difference to my rather sensitive ears. You can pick up an older used Bryston phono preamp for around $200-300. I am also told that the Bellari phono preamp is a very good, relatively inexpensive one to use.
- You of course need RCA connectors (your typical stereo connectors) to link the turntable to the amp and to link the amp to the computer’s soundcard (if the soundcard uses a 3.5mm input like a small earphone input, then you need a connector that goes from red/white RCA to 3.5mm plug, which you can get at most computer stores).

A computer with an excellent sound card

- This is, in my opinion, essential if you want CD quality sound from your transfers. You can simply use the built-in soundcard in your computer, but most such soundcards are far inferior to soundcards that were purpose-built for high quality sound. One of the keys here is the analogue to digital converter (ADC) within the sound card. If the converter within the soundcard is not good or is just average, then you loose a lot when you’re recording. M-Audio produces many useful audio interfaces for linking your computer to sound equipment, and I chose the M-Audio Audiophile 2496, which has RCA in and out (analogue signal), as well as SPDIF (digital signal). The RCA connectors allow direct connections from stereo equipment.
- I should mention that I did thorough sound-tests with other equipment before choosing the 2496. I compared my in-built soundcard to the external USB Edirol UA1EX and found that the

latter was better but not astoundingly better. I also tried Soundforge's 24-bit external soundcard and found that it was inferior. I then tried the internal M-Audio 2496 and found it was considerably better that the external Edirol. As the name implies, my soundcard gives me the ability to record at 24-bit (higher quality than a CD's 16-bit) and with sampling rates up to 96,000 (the quality of DVD audio).

Recording: Audacity software

- Audacity is an excellent, free audio recording program. This allows you to record any sound input into the soundcard device of your computer, in this case sound input from your turntable via your amplifier. You need to go into "Preferences" under "Edit" and click on "Audio I/O" in order to make sure that you have your high-quality soundcard (if you have one) chosen as default.
- Recording levels: The volume level of the sound from your LP that is going through the amp to your computer will not be at an optimum level (optimum level is a peak of -3 to 0 dB). You want to have a recording come close to but not exceed 0 dB (or, say – 3dB to play it safe) at its loudest moment. Any louder than 0 dB will create a terrible sound in digital music (Audacity warns you of this with a little red mark at the right end of the audio-meter). There are two ways to optimize recording level: (1) Adjust the volume level on some external equipment (e.g. amplifier, external preamplifier) such that the loudest moment on the LP reaches but does not exceed 0 dB on input meter in Audacity. (2) Adjust the volume level after you record by using the "Gain" slider to the left of the picture of your wav recording in Audacity. I find that the latter results in a lowering of the sound quality, in part because you are also adding gain (volume) to any background sound from the turntable or system, such as the equipment's low running noise (but most others do not notice this as I do). I instead adjust the volume to an optimum level by using the large earphone output on my amplifier as my main out from the amplifier to the computer's soundcard (which requires a earphone to RCA connector). (The tape-out RCA jacks of an amp cannot have the volume adjusted). Then I simply adjust the volume on the amplifier to arrive at the optimum level. Getting your recordings as close as possible to -3 to 0 dB also helps to have the volume of your recordings come close to those of a typical bought CD (so that you don't find yourself always having to adjust volume level while listening). Avoid applying a software's gain equalization feature to groups of files which makes all of your digital songs equal in volume level but may result in loss of detail in the sound quality.
- Lowering the noise floor. If you want the best recordings, it is best to spend some time experimenting and lowering the noise floor. Computer related equipment including DSL modems and monitors can add noise to your recordings if plugged into the same outlet as your turntable and amp or phono preamp. Also, if you link your computer to another sound system or to a system that is linked to a TV cable or antenna, this can create a low hum (often caused by an electrical groundloop). The "noise floor" is the overall running noise of the entire system as it would appear when you are recording in audacity with the volume already set to record a record but without lowering the needle to the record (in other words, you have the record player and amp on and have already set the volume to max out at 0dB but you haven't lowered the needle to play). At first, my noise floor was about -66 to -63dB (as viewed in Audacity) and then I moved my DSL modem and monitor to another outlet and the noise floor was lowered to -69dB. Now with my Bryson phono preamp I have lowered things further so that, when I'm set to record maxing at 0dB, my noise floor is usually -74dB to -78dB (before setting down the needle). This means that more of the small details in the music will have a chance to come through and you'll have quieter sound in the silent parts of music. If possible, link between your computer and another sound system using TOSLINK optical cables, which are not susceptible to electrical interference (digital coax and regular RCA cables will transfer noise — my TV antenna,

for example, added about 10dB of noise to my recordings before I ensured my TV was utterly independent my main sound system which was connected to my computer, and optical connections between an amp and things that are connected to the TV and its reception cable, such as DVD players, permit this).

- Recording quality: Audacity by default records at a 32-bit level, which is exceptional (CD's are 16-bit and you need to change this setting when you export). Leave it at 32-bit unless you have no room on your hard-drive. Before you record, you also need to choose the sample rate or "Project rate (Hz)" as it appears in the Audacity window. CD's are typically 44100 Hz, so you need to use that rate if you mainly want to burn the recordings to CD. I tend to record at 48000 Hz and then convert to 44100Hz when I need a CD for the car. The bit-depth (e.g. 16 bit vs. 24 bit) is perhaps more important for sound quality, and that comes in at the exporting stage. (By the way, if your soundcard is only 16-bit, then that will be the maximum quality you will get regardless of Audacity's ability to work at 32-bit and to export at 24-bit).
- Exporting quality and file formats: The essential stage for maintaining the quality of your recordings is when you export to other formats. Audacity allows you to export to just about every standard audio format, including MP3, FLAC, and WAV (look under "Edit" > "Preferences" > "File Formats" for options). MP3 is a compressed format which means you loose sound quality (the most obvious loss comes with things like the deterioration of the sound of cymbals) but can fit a lot more on a CD or iPod or whatever. WAV is an uncompressed format which means that no audio data is compressed or lost, but then it is much larger in size (in terms of the space it takes on your hard-drive or CD). FLAC is, in a way, ideal, since it uses about half the space of a WAV file without loosing any data or detail in the sound-quality (both audacity and foobar2000 work with FLAC) and it supports "tagging" (attaching artist, date, album, album art info to the files). With the way hard-drive sizes are going, there is no harm having large files, and if you want high quality recordings work with WAV (or AIFF on a Mac) or FLAC. (You will want to save the individual tracks as FLAC only AFTER you have used Clickrepair, since that program works with WAV only at this point). Beyond the file format, you need to decide on what bit-depth and sample-rate to export the file at. Because I am going almost completely digital (and not usually producing actual CDs much anymore), I export all of my records at 24-bit and a sample rate of 44100 Hz, which does not take up much more space than 16 bit but does reveal more detail in the music if listened to on a good stereo system with excellent speakers. If you want to burn a CD, however, it will need to be at 16 bit, 44100 Hz. You can always export from Audacity twice for a particular recording, as I often do (once into my official music folder at 24 bit and again into my burn-a-CD folder at 16 bit). For more discussion of 16 bit vs. 24 bit recordings, go here. You will ultimately use Audacity to create track-breaks and to use fade-in and fade-out effects at the beginnings and endings of songs. However, for now you export the entire album in WAV to clean it up in a program called Clickrepair, which is the next step.

Restoring or Repairing the recording: Clickrepair software

- Audacity has some useful functions for cleaning up and preparing the recording of your LP. In the past I often used the "Repair" function under "Effect" to eliminate ticks or clicks that can be heard from an LP (you need to zoom into the image of the wav file). This does work but it is very time-consuming and I generally only aimed for larger clicks.
- However, there is an astounding program that I only recently discovered that does an incredible job of eliminating virtually all clicks or other faults in the recording without audibly damaging the music itself: Clickrepair. I cannot overstate how essential and effective this inexpensive ($40) program is. It was created by a mathematician / professor in Australia who wanted to transfer his LPs to digital but could not find any program to remove clicks and other artifacts without damaging the music overall. So he designed and created his own program that

accurately isolates damaged areas and repairs them. This has even allowed me to salvage some LPs that I considered unusable (I generally only keep and use an LP if it has very limited noise / clicks). To remove clicks and other damaged areas from the recording, you simply "open" up the wav file of the entire album (or tracks using the "Batch" function under "File") that you exported from Audacity (which can be saved at 16 or 24 bit depths and at various sample rates), adjust certain settings in Clickrepair, and then press "start". You can then listen to the noise that is being removed to ensure no music is disappearing (e.g. certain drum-beats), listen to the input sound with noise and all, or listen to the cleaned output music (listening to anything slows the program down, however — I now turn "sound output" off since I know what settings are best). The settings I use in Clickrepair are not the defaults: I always leave "Pitch Protection" on (to avoid loss of things like repeated trumpet blasts that can look like clicks in a wav file); I set the "Declick" slider to 30 (unless a record is really bad in which case I put it up to 40); and I set the "Automatic" slider to "Automatic: All" (you may wish to put that at semi-automatic at first just to understand the process). Clickrepair then saves the repaired file (at its original bit depth and sample rate), which can then be imported back into Audacity. Once back in Audacity with the clean file for the entire album, you can then insert track breaks and fade-ins or fade-outs before exporting the individual tracks using "Export multiple" (where you once again need to ensure that the export bit-depth setting is what you want).

- Here is a sample from an album in quite poor shape (usually I would discard it). This is a recent transfer of Bruce Springsteen's "Something in the Night" from Darkness on the Edge of Town (1978) which illustrates how well the program works (to save server space, these are mere mp3s):

Before Clickrepair

After Clickrepair

Listening to your music: Foobar 2000

- I have found Foobar 2000 to be the best (free) program for playing music of various sample-rates and bit-depths (it can play 24 bit WAV or FLAC files which things like Realplayer cannot). This player is flexible for "tagging" information to your files (e.g. artist, date, album, track), if you are using MP3 or FLAC (but not WAV), and making various playlists from digital music on your hard-drive. (I used to run an RCA audio cable from the tape-out on the amp attached to my computer to the auxiliary input on the amp of my main stereo in a different room. Lengths of 50ft or less with RCA cables do not significantly lose audio quality to my ears. As of 2010, I now have a digital to analogue converter — a Cambridge Audio Dacmagic — which is connected with a 50ft optical cord. This has significantly improved the reproduction in the other room).

OTHER ONLINE RESOURCES

This sounds quite complicated but is actually quite easy once your get things together and run through the process, and the results you get are incredible. My outline here is based on my own experience, but others have far more detailed comments on various stages of the process. Here are a few of the websites I found most useful when I first started:

- Transferring LPs to CDR: Some Advice: This is among the best overall descriptions of the process, which goes into more detail than I did here.
- Convert Vinyl Records to CD: This is another useful guide to the process.

- Vinyl Engine: An excellent site that provides important information and free manuals for many turntables, as well as very good forum discussions.
- Tweaking Your Record Player: This is a rather long but helpful article on how to set up a turntable properly.
- Turntable Adjustment and Set-Up – Phono Cartridge Alignment
- Phono Hum Troubleshooting: This helps you through one of the more common issues with turntable set-up.
- Turntable Basics Advice page: Explains various terms and issues relating to turntables.
- 16 bit vs. 24 bit Audio Recording Demystified: This helps you to understand and decide whether to use 24 bit.
- Virginia Tech Multimedia Music Dictionary: This will explain all kinds of music and audio related concepts.

From:
https://wiki.condrau.com/ - **Bernard's Wiki**

Permanent link:
https://wiki.condrau.com/media:lptocd

Last update: **2017/06/25 20:24**