

BASICS

BASICS; From Vinyl to Digital, Hold the Crackle

By Roy Furchgott

Jan. 1, 2004

Correction Appended

SEARCH the Gnutella Network as you may, some recordings are so scarce or of such limited appeal that you cannot find them anywhere, except maybe in your own vinyl collection. But your rare 45 of Blondie's "Little GTO" need not be a stranger in the land of the CD player. Technology is available that will not only enable you to turn your hot wax into digital tracks, but will also let you clean up the static that separates your favorite Bruce Springsteen bootleg from its glory days.

To turn LP's into CD's, you will need some hardware: specifically a turntable, a preamplifier and a computer. You will also need software to digitize the analog signal, edit the digital recording, clean it and burn it to a CD or DVD.

Any turntable with a line-out connector will do, although you can also digitize other analog sources, like a radio broadcast, reel-to-reel tape or 8-track player (if you rescued yours from the Gremlin before you sold it).

To record from a turntable to a computer, the signal must first go through a preamplifier that will boost it to a recordable level. You can use a stereo receiver (most have preamp-out or phono-out connections), or you can buy a no-frills phono preamp for about \$30 at an electronics hobby shop.

You will also need to connect the preamp to your computer. The most common way to do that is with an adapter cable with two male RCA plugs at one end that attach to your preamp and a one-eighth-inch stereo phono jack at the other that connects with your computer. But different equipment makers use different connectors, so you might need another kind of adapter.

If sound quality is a big concern, consider investing in a preamp with an audio-to-digital converter. These devices incorporate a computer chip dedicated to converting analog signals to digital ones. In theory, the computer's main processor is always busy carrying out other tasks, so using a separate chip for conversion delivers better sound. In practice, the degree of improvement will vary with the quality of the converter. One such device is a preamp sound card, like the Phono PreAmp from Terratec (\$100, www.terratec.net), which puts a preamp with an analog-to-digital converter chip inside your computer.

Some LP restoration software suites, including Pinnacle Clean Plus (\$100), come with an external preamp that plugs into a U.S.B. port and works with your existing sound card. (Clean Plus and other software choices are described in more detail in the accompanying article.) There is also the iMic from Griffin Technologies (\$40, www.griffintechologies.com), a small input device that converts analog signals to digital outside of the computer, eliminating the possibility of electronic interference from other computer components.

Once the signal has been amplified and digitized, your computer takes over. Recording the signal and cleaning it up require extensive processing, so a powerful chip is needed to do it efficiently. The makers of most cleaning software recommend at least a 500-megahertz processor.

You also need lots of hard-drive space, because sound files occupy about 10 megabytes per minute; that would be almost a gigabyte for all 77 minutes of Captain Beefheart and His Magic Band's "Trout Mask Replica."

Three basic steps are necessary to get the digitized music ready and onto a disc. A recording program, sometimes called a ripper, captures the sounds. You can edit the digital recording, reducing static and other analog noise with filtering software and trimming excess lead-in time and adding fade-ins and simple effects with a wave form editor. Then you need a burning program to put the final product on a disc.

There are hundreds of individual sound-editing programs, from \$15 shareware to professional-quality software costing \$1,000 and up (see www.hitsquad.com for a list). Most consumer software costs \$40 to \$150, and often everything you need is bundled in a single suite. PC users can choose all-in-one products like Audio Cleaning Lab from Magix or Clean from Pinnacle, both of which are good for importing and cleaning.

For Mac users, things are a bit more complicated. There is only one moderately priced suite -- Roxio's Toast 6 Titanium (\$100 list price, but available for less) -- and it has limited filters for reducing noises. Much improved over the previous version, Toast 6 is more than sufficient for converting a reasonably well-maintained record collection.

There are plenty of other programs you can use to make your own suite, like Peak from Bias for recording and editing and Ray Gun from Arboretum Systems for cleaning. But the actual recording and cleaning will require more work. With those two programs, for example, you would have to record and edit the file in Peak, then save it as a generic sound file. You would then have to import it into Ray Gun, clean it and re-export it as a generic recordable sound file.

The ripper software, at least, is simple. It works just like a tape recorder: you drop the needle onto a record, adjust the ripper's volume meters on your computer screen to the optimum level and click the Record command. It will capture the music in real time, producing a faithful copy that includes scratchy surface noise. Some audio purists like the noise, which lends authentic analog warmth. If you are in that camp, and you have recorded a well-cared-for album, your job is done, unless you want to use your editor to trim excess dead space at the beginning or end of a song or add a fade-in for a little flourish.

But if you want to get rid of static, the next step is to use cleaning software.

These programs rely on algorithms to sort noise from music. The simplest ones make some assumptions what a music signal looks like, then eliminate everything else. Some programs have automatic analyzers that check for static, then suggest appropriate filter settings.

But these programs are not as accurate as a pair of ears. Even the best cleaning programs can benefit from some manual adjustment. Some allow you to sample a particular sound -- say, a pop heard with each rotation of your platter -- and remove just that sound.

While experts spend more for their hardware and software than the typical home user, the restoration techniques they use are the same. Brian Slack, co-founder of Widget Post Production in Culver City, Calif., uses a \$40,000 cleaning device from Cedar in combination with stacks of third-party software to restore about 250 movie soundtracks a year, like "West Side Story" and the Pink Panther series.

Mr. Slack said that although some software offers preset corrections, say for 78 r.p.m. discs or tape, you are best off listening carefully and making your own settings. "For the most part, you want to sit down and do it on a record-by-record basis, sometimes on a track-by-track basis," he said.

He also recommended keeping a raw copy of your recording as a backup and saving a copy of the recording at each step as you work on it, so you can go back a step without starting over.

Do not overscrub. "There is definitely a point of diminishing returns where you can remove so much noise that you are removing the music as well," Mr. Slack said.

Finally, rippers can copy music at different sample rates. Generally, the higher the rate, the better the fidelity. For a CD that will be played on a home or car system, the standard settings are 44.1 kHz and 16 bits resolution. Higher sampling rates will not play on regular home CD systems, but will play on electronic devices (like an iPod). To capture the best sound possible, set the ripper at a higher level, like 24, 96 or even 192 bits resolution, which is what professionals use, and then play it through a hard drive.

Recordings made at higher sampling rates can always be converted to lower rates later if you want to burn them to a CD.

If you want to try professional quality software, Waves offers a spectacular freebie with its Restoration Bundle. You can download its \$1,200 filters for removing static at no charge for a two-week trial. These filters work as add-ons, called plug-ins, with most sound editing programs.

To commit your work to CD, you need burning software. One program is about as good as the next, although there are subtle differences that will mean something to the technologically advanced.

One word of caution: not all burner software plays well together. If you use a software package that adds new burning software to your computer -- like some of the suites discussed here -- the new burner software may fight with the old software for control of your CD drive. Sometimes the program you want to use loses, and you cannot burn a disc. The simple solution to this problem is to get rid of all the burner programs except the one you like best. Uninstall the rejects carefully, though, so they will not leave behind pieces that could continue to bedevil your burner.

Cleaning up digitized recordings can take some practice. But won't you be pleased to be the only one on your block with a mix CD that includes Robert Ellis Orrall's "Call the Uh Oh Squad"?

Conversion

Software choices for capturing and editing analog recordings include do-it-all suites and a selection of specialized tools.

Pinnacle Clean Plus 4.0

Pinnacle Systems www.pinnaclesys.com -- Cleans click, crackle, hiss and rumble and will automatically analyze recordings and set cleaning levels. Extensive array of features can be distracting. List price \$100, but available for less. For Windows 98SE and later.

Audio Cleaning Lab 2004

Magix Software www.magix.com -- Filters static. Stereo FX increases channel separation. Gripes: MP3 converter costs \$15 extra, and the CD-burning software uses a proprietary format. \$40. For Windows 98 and later.

Toast 6 Titanium

Roxio www.roxio.com -- The LP-to-CD component, CD Spin Doctor 2, makes recording easy, and the filters are effective, but the suite has limitations. Editing is somewhat counterintuitive, and you cannot save files as MP3's. Be sure to download the updater to fix a problem that crashes Spin Doctor. \$100. For Mac OS X 10.2 and later.

Peak LE 4

Bias www.bias-inc.com -- A home-use version of Peak 4, a high-end sound-editing program. Intuitive enough to record, edit and add simple effects without checking the user's manual. \$99. For Macintosh OS X 10.2 and later.

Soundsoap

Bias www.bias-inc.com -- Made to clean tape, it will not scrub pops and clicks, but it is nice for hiss and hum. It can leave sound a bit muffled; not ideal for music, but just right for cleaning up voice -- say, interviews on digital home movies. \$99. For Macintosh OS X 10.2 and later or Windows XP.

Ray Gun Pro

Arboretum www.arboretum.com -- Cleans and restores and is affordable, but inconvenient. Uses its own "hyperengine" program, so music must be imported for cleaning and then re-exported. \$149. For Macintosh OS X 10.2 and later, or any version of Windows with DirectX.

Restoration Bundle

Waves www.waves.com -- Filters static within programs like Peak. Sensitive enough to take out noise and leave much of the treble intact. One appealing feature: to make sure you are not removing music, there is a button that lets you hear what is being erased. \$1,200; two-week free trial available. For Mac OS 8.5 or later or Windows 95 and later. Roy Furchgott

Correction: January 8, 2004, Thursday An article in Circuits last Thursday about copying LP's onto CD's misstated the sampling settings at which the software captures the best sound from analog recordings. It is 24 bits and 96 or 192 kilohertz, not 96 or 192 bits. The article also referred incorrectly to the connection between a stereo receiver's preamplifier and a computer. The output plug from the receiver is the "line out" or "record out" connector, not "phono out."