

Software Review

Groove Mechanic 2.5c

By Gary Galo, Regular Contributor

The Groove Mechanic 2.5c, Coyote Electronics Inc., 11174 Canyon Cres., Delta, BC, Canada V4E 2R8; <http://www.coyotes.bc.ca/info@coyotes.bc.ca> (e-mail), \$39, requires Windows 95 or higher.

I have several friends who make their livings doing audio restoration, including 78-rpm discs, lacquer broadcast transcriptions, LPs, and tapes of every conceivable format. A visit to their studios reveals six-figure investments in Cedar and Sonic Solutions audio restoration equipment, including de-clicking, de-crackling, de-hissing, azimuth correction, digital equalization, and editing. For those of us who can't afford or justify such expensive equipment, the "trickle-down" effect of technology has produced a large quantity of surprisingly affordable audio noise reduction and editing software.

I use Sony Digital Media's Sound Forge 7.0 (formerly made by Sonic Foundry), along with their Noise Reduction 2.0 and CD Architect 5.0 package. These programs once sold separately for close to \$1000, but now Sony bundles the three together, throwing in the Noise Reduction and CD Architect packages for the cost of Sound Forge alone. Programs offering similar performance would have cost thousands of dollars

only a few years ago.

Groove Mechanic 2.5c is an extremely affordable package designed for removing noise from LPs and tapes. Groove Mechanic has been designed for the non-technical user, and offers remarkable simplicity of operation—you don't need to be an engineer to quickly master the program and achieve good results. The program is optimized for removing clicks and pops from vinyl LP records, hiss from tapes, and rumble from any audio source. The noise-reduction portion of version 2.5c is essentially the same code as 2.5b, but re-compiled with an updated compiler. This corrects a very rare problem in which a prominent click is not repaired. A minor bug dealing with track names has also been fixed.

Groove Mechanic is available only as a download from the manufacturer's website. The complete program is 1.3MB, so it will take just a few seconds with a broadband connection. You can download and try this program for a 15-day evaluation period. After that, de-noising will be limited to file lengths of two minutes. When you purchase the program online, you are given a registration code to enter into the program, which enables full, permanent operation. Groove Mechanic has a good

help menu, and a

59-page user manual in .PDF format is also available online. I recommend downloading the manual, which gives a very clear overview of the program.

When you start Groove Mechanic, it defaults to the windowed mode. There's really no need to run it full screen, since there's no advantage to stretching the audio display vertically. In fact, it actually looks better windowed, but I recommend stretching the display so that it fills the screen horizontally.

You can bring audio into Groove Mechanic in two ways. The Capture mode allows you to record directly to the program through the line inputs on your sound card. You normally use the volume controls supplied with your sound card software, or with the Windows volume controls. Groove Mechanic's main display window can be toggled back and forth between Recording Level Meters (Photo 1) and Audio Timeline (Photos 2–4), which is the main display of your saved file. Groove Mechanic will also open .WAV files produced by other programs, and save processed files in .WAV, .MP3, or .OGG formats (.WAV is the default).

I recorded all of my test selections for evaluating these programs on Mitsui Gold CD-Rs, using a Sony CD-R800 professional CD recorder connected to my main stereo system. I extracted the tracks on the CD-Rs and converted them into .WAV files using Sound

PHOTO 1: THE GROOVE MECHANIC "RECORD LEVEL" METERS. THE PROGRAM USES THE LINE INPUT ON YOUR SOUND CARD FOR RECORDING. RECORDING LEVELS ARE SET USING EITHER THE SOUND CARD OR WINDOWS VOLUME CONTROL SOFTWARE.

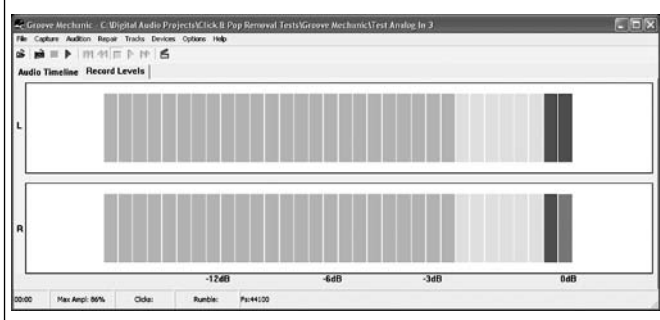
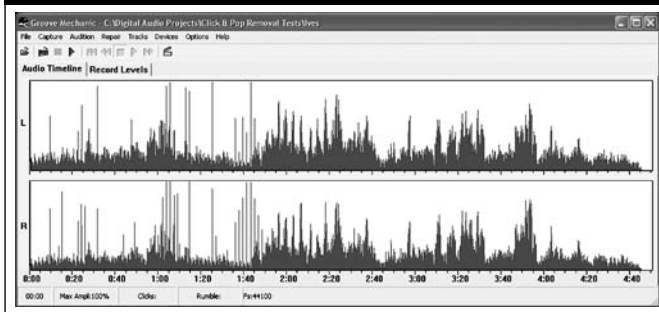


PHOTO 2: THE COLUMBIA IVES RECORDING LOADED INTO GROOVE MECHANIC. THE VERTICAL SPIKES ARE LARGE CLICKS, CAUSED BY A PRESSING DEFECT ON THE RECORDING.



Forge (Groove Mechanic won't extract audio from a CD). This is sonically the best route, in my view, even though I have a very good sound card (Creative Labs Audigy 2) in my computer. The over-

SIMPLE OPERATION

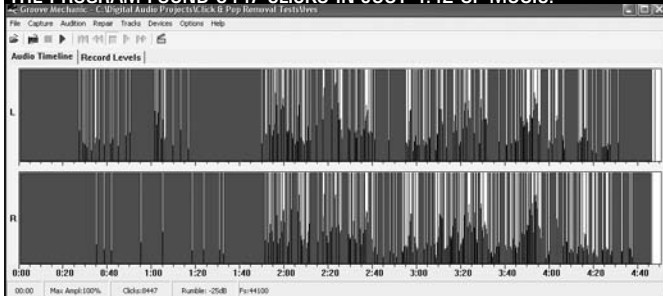
Using Groove Mechanic could hardly be simpler. First, you open the .WAV file that you wish to process. The file will appear in the left and right display windows (*Photo 2*). The window gives you an amplitude display over time, but doesn't show the actual waveform. The loudest clicks will be immediately visible as large vertical spikes louder than the music.

At this point, you can play the file using the transport controls on the toolbar. All noise reduction begins with an analysis of the file—under the Repair menu, select “Analyze Clicks and Rumble.” The program will take a few moments (depending on the file length) to analyze the file, and will mark all of the clicks with vertical red lines in the display window (*Photo 3*).

Then, run the appropriate noise-reduction program on the menu, which will be “Fix Clicks and Thumps” for LP records. The program will take a few moments to remove the clicks, and return the screen to its original appearance (the red vertical lines will be gone). You can now play the file and verify how successfully the clicks were removed. Large clicks in the original file will still be visible in the display, making it easy to determine whether or not they were removed when you play the file.

After you've repaired the file, you can save it. Groove Mechanic automatically adds “_fixed” to your original filename, so you won't accidentally overwrite your original file. When you close and

PHOTO 3: THE DISPLAY AFTER ANALYSIS OF THE IVES RECORDING. THE PROGRAM FOUND 8447 CLICKS IN JUST 4:42 OF MUSIC!



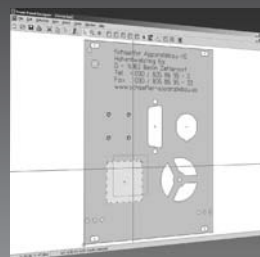
then re-open the “_fixed” file, the display shows only remaining clicks—all those removed on the first pass are gone (*Photo 4*).

Hiss reduction begins with the same analysis. In order to reduce hiss, the program must have a sample of the noise without the music. After the initial analysis, you tell the program to get a noise base at the playback cursor, or at the end of the file. Then, select “Fix Hiss.” The program will take a few moments to reduce the hiss. Then, you can play the repaired file to see how effective the hiss removal has been.

Under the “Options” menu, Groove Mechanic allows a few user adjust-

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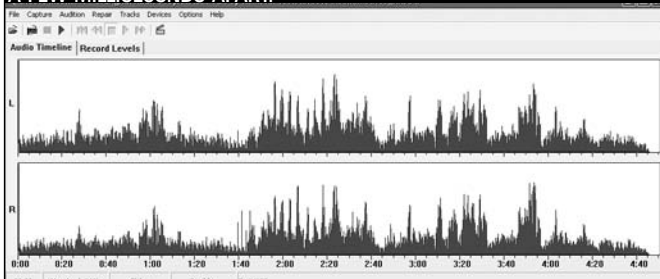
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PHOTO 4: THE RESTORED FILE AFTER SAVING, AFTER THREE PASSES WITH GROOVE MECHANIC. THE PROGRAM DID WELL ON MOST OF THE CLICKS, BUT A FEW REMAIN AROUND 1:40. THESE REMAINING CLICKS ARE REALLY CRACKLES, SINCE THEY CONSIST OF MULTIPLE CLICKS ONLY A FEW MILLISECONDS APART.



ments. You can select three click settings—large, medium-to-large, and “all.” Fine adjustment between these coarse settings is also possible. Three boxes, if checked, select “Detect Pops (Wide Clicks),” “Ensure clicks are not due to voice,” and “Don’t find clicks that are not audible.” I find that selecting “All clicks,” along with checking all three boxes, works very well for most material (these are the program defaults). You can set the Rumble Filter for a corner frequency of 20, 25, or 30Hz.

The Hiss Threshold Control choices

off if you select Play after Stop. If you uncheck it, the cursor will return to its original position when you select Stop. This is a matter of preference, but I’m glad the program gives you a choice.

Nostalgic for the MS-DOS days? Groove Mechanic can also be run non-interactively from the command prompt. In a single command line operation, you can have Groove Mechanic open a file, analyze it, repair it, save it, and exit. You can also write batch files (remember them?) that will instruct Groove Mechanic to work on several different files at once. The affection I once held

are “Normal,” “Remove less noise,” and “Remove more noise.” There are also a few General Preferences that most users can leave alone. One that I changed is “Stop updates the playback cursor.” If left checked, the playback will resume where it left

for MS-DOS waned years ago, so I did not try running the program from the command prompt.

LP TESTS

Table 1 is a list of the test recordings I made for evaluating both of these programs, along with brief descriptions of the various noise problems. For my LP tests, I copied portions of five different recordings with specific problems, usually two to four minutes long. My “second copy” of the Sheffield direct-to-disc of Wagner excerpts conducted by Erich Leinsdorf has light, random ticks and low-level background crackle. I used a portion of the Prelude to *Tristan und Isolde* for these tests. The first pass removed nearly all of the clicks, and a second pass got most of the remaining ones. Background crackle was lowered, but not eliminated.

A couple of low-level ticks remained, but their high-frequency content was greatly reduced. There’s an option in Groove Mechanic called “Force thump detection at cursor.” After analysis and repair of clicks and thumps, you can move the cursor to a spot just before a problematic pop, and instruct the program to analyze this one thump. Groove Mechanic will search for remaining thumps for five seconds beyond the cursor. I tried this on the remaining clicks, but the program gave me the message “No thump found near playback cursor.”

The Hindemith disc conducted by William Steinberg has moderate, random ticks. With version 2.5b., one pass with Groove Mechanic removed all but one click in the right channel. I tried two more passes, but the right channel click remained, despite the fact that the program continued to find new clicks on every pass. Forcing thump detection at the cursor did not remove the remaining right channel click. This is the rare problem with version 2.5b. Version 2.5c worked flawlessly on this selection—all clicks were detected and removed on the first pass.

On the Furtwängler Beethoven 9th recording, the first pass removed the minor click, but barely touched the very loud one. Here, forcing thump detection at the cursor did the trick. After the first pass, I tried this option, but the program detected a thump in only

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the right channel—the pop in the left channel remained. Running this option after a second general click removed the remaining left channel pop.

On the Ives LP Groove Mechanic

TABLE 1

Recordings Used to Evaluate Groove Mechanic 2.5c

LP CLICKS AND POPS

Charles Ives: *The Things Our Fathers Loved*—"Slow March," "Canon," and "There's a Certain Garden." Helen Boatwright, Soprano; John Kirkpatrick, piano. Columbia Masterworks M4 32504, Record 3, Side 1, Band 1. (Loud crackles and pops at the beginning due to a pressing defect).

Beethoven: Symphony No. 9 in D minor. Berlin Philharmonic Orchestra conducted by Wilhelm Furtwängler, Rec. London May 1, 1937. Toshiba/EMI WF-60073-74. Excerpt from 2nd Mvt. (There's a gouge in these otherwise pristine records on Side 2, causing two ticks, one minor and one very loud).

Wagner: *Tristan und Isolde*—Prelude to Act 1. Los Angeles Philharmonic Orchestra conducted by Erich Leinsdorf. Sheffield Lab LAB-7 (Direct-to-Disc). (Light, random ticks).

Hindemith: *Symphonie Mathis der Maler*, Mvt. 1 Introduction. Boston Symphony Orchestra conducted by William Steinberg. Deutsche Grammophon 2530 246. (Moderate, random ticks). (An outstanding performance by an underrated conductor that deserves a CD re-mastering by DG).

Walton: *Belshazzar's Feast*. Crane Chorus and Crane Symphony Orchestra conducted by Brock McElheran. CSM-1003, a record produced privately by The Crane School of Music, SUNY Potsdam, from analog tapes I recorded in 1984. (I had some extra copies of this record lying around, so I sacrificed one for these tests. I put three large, evenly-spaced scratches at the beginning of the piece, and three more large scratches 1/2" apart at the beginning of Side 2.)

TAPE HISS

Fauré: *Requiem*—Libera me. Crane Chorus and Crane Symphony Orchestra conducted by Nadia Boulanger. Spring Festival of the Arts, 1958. 15-ips full-track mono original tape.

78-RPM TESTS

(These discs were transferred to digital using a Technics SP-15 turntable, SME-3012R Tonearm, Stanton 500AL Cartridge with truncated elliptical styli of various sizes, and my modified McIntosh C-8 preamplifier. Playback speeds and phono equalization are noted for each record. A modified Phoenix Systems Parametric Equalizer was also used for the acoustical recording).

Verdi: *La Traviata*—Prelude to Act I. Philharmonic-Symphony Orchestra of New York conducted by Arturo Toscanini. Victor 6994-A, rec. 1929. 77.0-rpm, 300Hz bass turnover, -5dB at 10kHz. (An unworn copy of a late-1930s pressing, but there are a large number of clicks and pops, plus the usual steady-state surface noise.) Cohan: *Over There*. Enrico Caruso, tenor; Victor Orchestra conducted by Josef Pasternack. Victor 87294, rec. 1918 (acoustical recording). 75.00-rpm, flat phono EQ, parametric equalizer set to +6dB at 180Hz, 0.7 octaves. (A pristine, single-faced copy with virtually no clicks or pops, but the usual steady-state surface noise from the abrasive fillers used in Victor's shellac formula.)

Verdi: *Il Trovatore*—"Miserere." Rosa Ponselle, soprano (Leonore); Giovanni Martinelli, tenor (Manrico); Victor Orchestra conducted by Giulio Setti. Victor 8097-A, 77.0-rpm. 400Hz bass turnover, flat treble. (The usual steady-state surface noise present on scroll-label Victors from the late 1920s, plus some clicks and pops, and distortion on the final chord caused by too high a recording level.)

was pretty effective in reducing the low-level crackles caused by a pressing defect, and most of the large clicks were caught the first time through. But, several of the clicks were not removed even on the fourth pass. I brought the restored file into Sound Forge to zoom in on the clicks. I found that these clicks were more like crackles, in that each one consisted of multiple clicks only milliseconds apart. Groove Mechanic makes no claims for removal of crackle, which is a much more difficult proposition than single, isolated clicks (Sound Forge's Vinyl Restoration will fix these problematic crackles).

I deliberately ruined an extra copy of the *Belshazzar's Feast* record that I made about 20 years ago. Using a compass point, I put three evenly spaced scratches on side one, and three scratches about 1/2" apart on side two. These are very loud scratches with a lot of high-frequency content. Side one required two passes to get them all. The program did not remove all traces of the scratches, but left behind only a very low-level, low-frequency bump.

Side two required three passes to

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get everything, again leaving only a low-level, low-frequency component. On both sides, the second and third passes did not further improve the low-frequency bumps left behind—they only helped on scratches missed by the first two passes. Scratches like this make a record nearly useless, but Groove Mechanic restored this recording to a very listenable state.

Even with professional restoration equipment, it is often necessary to run more than one pass in order to remove or minimize noise. My friends in the restoration business tell me that it is often better to run multiple “light” passes rather than a single “brute force” treatment. Groove Mechanic’s algorithms have been intelligently designed, with multiple passes in mind. The manual notes that you usually hit the point of diminishing returns after two or three passes, which I found to be the case.

TAPE HISS REDUCTION

I recently made a digital transfer of a 1958 Crane School of Music performance of Gabriel Fauré’s *Requiem* conducted by Nadia Boulanger. I did this for a colleague on our faculty who was presenting a paper on Boulanger’s association with our school (Boulanger was a close friend, and a former teacher, of Helen M. Hosmer, director of our school from 1930–1966; Hosmer brought Boulanger to Potsdam several times as guest conductor of our Spring Festival performances by Crane Chorus and Crane Symphony Orchestra). This recording is a 15ips, full-track mono tape made on equipment well below the state-of-the-art for 1958, and it is quite hissy. I selected the “Liberate me” movement for this test.

Groove Mechanic did a surprisingly good job reducing the hiss on this recording. I found that the “remove less noise” option worked best. If I select the “Normal” option, I begin to hear some subtle, high-frequency swishing artifacts around the strings. The “Remove more hiss” option increases the audibility of those artifacts, and also introduces some subtle pumping of dynamics. This is no surprise, since even the multi-thousand dollar hiss reduction programs will leave artifacts if overused.

I was quite impressed by how well Groove Mechanic handled this tape

using the most conservative setting. Other settings may be appropriate for different program material. Groove Mechanic does not audibly degrade the high-frequency response of the original file, which is very impressive. Surprisingly, Groove Mechanic also found a large number of clicks on this tape, but I didn’t find any benefit in removing them, since they are not audible.

78-RPM DISCS

Groove Mechanic wasn’t specifically designed to handle noise from 78-rpm discs, and the manufacturer doesn’t make any claims for 78s. But, I decided to try a couple anyway. My Victor copy of the *Traviata* Prelude with Toscanini and the Philharmonic-Symphony Orchestra of New York has minimal wear, but a lot of clicks and hiss. Two passes with Groove Mechanic removed all of the clicks, leaving only a steady background of hiss. These hiss-removal algorithms are not compatible with the hiss encountered on 78s. Even the most conservative setting caused dynamic pumping and high-frequency artifacts, but the click removal worked quite well.

On the other 78-rpm discs, the program was less effective. Groove Mechanic seems to interpret high levels of background hiss as very closely spaced clicks, and can introduce crackling sounds where none existed before. This was especially true in a few spots on the “Miserere” from *Il Trovatore* with Ponselle and Martinelli.

Caruso’s “Over There” is an extremely clean copy, but with the normal amount of 78 background noise. Click removal actually introduced a layer of noise around loud, high notes. Again, Groove Mechanic wasn’t designed for 78s, but discs with moderate, random ticks, such as the Toscanini *Traviata* recording, it works pretty well.

LIMITATIONS

Groove Mechanic has a couple of limitations. The program allows you to produce boundary markers in the display, which are ultimately used to produce tracks on the CD. But, it isn’t possible to zoom in on the display window, so an entire CD’s worth of audio will be displayed across the width of your computer screen. This makes it difficult to navigate within the window

on files as long as a full CD, and rather tricky to precisely place the boundary markers that will be converted into CD tracks. The manufacturer tells me that a zoom feature will be added to a future release.

Groove Mechanic doesn't support CD burning. Most computers come with CD burning software (my Dell Dimension 4600 came with Sonic Record Now!) that will burn CDs from .WAV files. Groove Mechanic will not embed track information into .WAV files. When you extract your audio to a file, Groove Mechanic actually extracts each track to a separate .WAV file, the same way .MP3 files work.

One of the nice things about the .WAV format is that it doesn't have the "one-track-per-file" limitation of the .MP3 format. The .MP3 format—sonically and functionally—was designed with pop music in mind, but the designers of the .WAV format had the foresight to consider the needs of classical music as well. Since Groove Mechanic does not save the track boundary information with your .WAV file, you have only one chance to get it right before you close the file and lose all of your track information. If you find that one track location is out of place after you've extracted all of the tracks to individual files, you must go back into Groove Mechanic and mark the boundaries for the entire CD again.

When you use your CD burning software to burn the files to a CD, a two-second pause is usually placed between each track, unless you tell the program to do otherwise. With many classical works, especially operas, there are often multiple tracks within continuous music. The two-second pause between tracks—an inherent limitation with "track-at-once" CD burning—is no good for classical music. With Sonic Record Now!, you select burning in the Disc at Once mode from the options menu, rather than track at once.

To my surprise, this actually works fine. Multiple tracks—even if they occur within continuous music—are reassembled seamlessly this way. If your interests include classical music, you'll need a CD burning program that allows "Disc at Once" burning.

Your CD burning software may also make it possible to overcome the lack of zoom capability with Groove Me-

chanic. For longer CDs, it makes sense to work on only a few tracks—or a single LP side—at a time, minimizing the time in the display window. After processing all of the .WAV files you need for one CD, use your burning software to assemble the various tracks in the desired order.

CONCLUSIONS

Every audiophile probably wishes to know whether this software "degrades" the sound quality. If you are a lover of vinyl who insists that the LP is still superior to the CD, no computer program for digitizing LPs will satisfy you. Programs like this were not designed for you. Keep your LP playback equipment in good working order and continue to play those LPs.

The process of digitizing LPs will invariably introduce some change to the original sound, especially at the 44.1kHz/16-bit CD standard. There are many places where this degradation can occur, especially in the analog circuitry and A/D converters in your sound card. There are also numerous opportunities for the introduction of clock jitter, including the noise caused by the switching power supplies used in all computers.

If you perceive a change in the sound of your LPs, there are many factors that can account for this. Groove Mechanic does a good job of minimizing or removing noise without introducing audible degradation of the original .WAV file. If the program errs, it is on the conservative side, leaving a bit of noise behind rather than introducing audible artifacts.

Groove Mechanic is an effective program for click, hiss, and rumble removal. It isn't perfect, but it offers extremely good performance at a bargain price. Even with expensive professional restoration equipment, it often is not possible to remove all of the noise from a recording, at least not without degrading the original sound. Groove Mechanic's algorithms have been intelligently designed to deliver good results, while keeping the user interface simple. If you are looking for an easy, cost-effective way to convert your LPs to CD, cleaning them up in the process, Groove Mechanic will do the trick. **ax**

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