STRETCHLEARN · WORKBOOK

Audio Restoration & Cleanup — Workbook

This workbook turns the course into a hands-on toolkit you can use on real damaged recordings. Each section mirrors a course module, with exercises to build the diagnostic and repair skills, worksheets to capture your settings and decisions, and checklists to keep every restoration artifact-free. Use the templates to log defects, track your repair chain, and confirm you hit delivery loudness before you export.

Listening, Diagnosis, and Your Restoration Toolkit

Build the diagnostic habit of identifying every defect on the spectrogram before touching a repair, and set up your tools correctly.

Exercise: Name That Defect on the Spectrogram

Take three different problem recordings (or download free noisy samples). For each, find a one-to-two-second section with only the unwanted sound, open the spectrogram in Audacity or RX, and identify the defect by its visual signature before listening closely to confirm.

• What shape did you see for each defect (horizontal line, vertical streak, even haze, flat top), and what does it tell you?

• For any hum present, is the line at 50 Hz or 60 Hz, and how many harmonics can you count above it?

• Which single tool from the order of operations does each defect call for, and why that one?

Worksheet: Recording Diagnosis Brief

Complete one brief per recording before you process anything, so you fix the real problems and skip tools you do not need.

File name and source (dialogue / music / archival)

Sample rate and bit depth

Hum present? (Y/N) and fundamental frequency (50/60 Hz)

Clicks / crackle / mouth noise present? (Y/N) and roughly how often

Clipping present? (Y/N) and how severe (light / moderate / heavy)

Broadband noise type (hiss / fan / traffic / rumble)

Isolated one-off noises to spectral-repair (list with timestamps)

Special problems (reverb / wind / sibilance)

Tools and order you plan to run

Checklist: Project Setup Checklist

[ ] Flat, unprocessed 24-bit WAV master saved and set aside untouched
[ ] Working on a duplicate copy, never the original
[ ] Spectrogram view enabled in your editor
[ ] Project kept at source sample rate and bit depth (no mid-workflow MP3)
[ ] Closed-back or studio headphones connected for monitoring
[ ] Youlean Loudness Meter (or equivalent) installed for the final stage

Removing Hum, Clicks, and Impulsive Noise

Practice the tonal and transient repairs that come first in the chain and learn the restraint that prevents thinning and lisping.

Exercise: De-Hum Without Thinning the Voice

On a recording with audible mains hum, remove it two ways and compare. First use a narrow notch filter (Q 8 to 10) at the fundamental plus each audible harmonic in Audacity; then use RX De-hum with harmonic removal. A/B each against the original, listening for lost low-end body in the voice.

• Was the hum at 50 Hz or 60 Hz, and which harmonics (120, 180, 240 Hz) did you also need to remove?

• At what point did the voice start to sound thin or boxy, and how did you pull back?

• Which method (manual notches vs RX De-hum) gave the cleaner result and why?

Exercise: Automatic vs Manual De-Click

On a clip with both vinyl-style crackle and a few loud isolated clicks, run an automatic De-click (RX) or Click Removal (Audacity) pass at moderate sensitivity for the crackle, then zoom in and manually repair each remaining loud click with spectral repair or Audacity's Repair effect.

• What sensitivity or threshold setting caught the clicks without flagging consonants?

• How many loud clicks needed manual repair after the automatic pass?

• Did any consonants start to lisp or lose attack, and how did you correct it?

Checklist: Tonal and Transient Repair Checklist

[ ] Hum fundamental and audible harmonics removed; spectrogram lines gone
[ ] Voice still sounds full, not thin or boxy, after de-humming
[ ] Crackle reduced with an automatic de-click pass at moderate sensitivity
[ ] Remaining loud clicks repaired manually by reconstruction, not deletion
[ ] Mouth clicks reduced where distracting, but not sterilized
[ ] Consonants still crisp with no new lisping or dulling

Clipping, Distortion, and Broadband Noise

Reconstruct overloaded peaks and reduce constant background noise to a natural floor without watery artifacts.

Exercise: Rescue a Clipped Recording

Find or create a clipped recording (record a loud sound well past 0 dBFS). Confirm the flat-topped peaks on the amplitude view, then run De-clip (RX) or Clip Fix (Audacity), and reduce makeup gain so the rebuilt peaks sit near minus 3 to minus 6 dBFS.

• Roughly what fraction of the file was clipped, and how complete was the recovery?

• How much did you lower the level after de-clipping to keep peaks below 0 dBFS?

• Where did you hit the limit of what de-clipping could fix, and how did you handle it?

Exercise: Find the De-Noise Sweet Spot

On a hissy or noisy clip, capture a noise profile from a voice-free region, then apply broadband noise reduction three times at roughly 6, 12, and 20 dB of reduction. Compare them for the point where speech first turns watery, and add an 80 Hz high-pass filter for rumble.

• At which reduction amount did the speech first sound watery, swirly, or underwater?

• What integrated noise-floor reading (in dBFS) did your best setting reach?

• How did adding the 80 Hz high-pass change the low-end rumble versus de-noising it?

Worksheet: Noise Reduction Settings Log

Record the settings that worked for each recording so you can reproduce good results and learn your own sweet spots over time.

File name and noise type

Noise profile captured from (timestamp of noise-only region)

Tool used (Audacity Noise Reduction / RX Voice De-noise / RX Spectral De-noise)

Reduction amount applied (dB)

Sensitivity / smoothing settings

High-pass filter frequency (Hz)

Resulting noise floor (dBFS)

Artifact notes (any watery or pumping sound?)

Checklist: Distortion and Noise Checklist

[ ] Clipping confirmed on the amplitude view before applying De-clip
[ ] Rebuilt peaks brought below 0 dBFS with makeup gain reduced
[ ] Noise profile captured from a clean, voice-free region
[ ] Broadband reduction kept conservative (started 6 to 12 dB)
[ ] No watery, swirling, or pumping artifacts in the result
[ ] High-pass filter used for rumble instead of heavy de-noising
[ ] A natural, low room tone preserved rather than dead silence

Workflow, Quality Control, and Delivery

Assemble a repeatable chain, run a disciplined QC pass, and level and export the right file for the destination.

Exercise: Run Your Chain End to End

Take one real damaged recording and restore it fully using your ordered chain: master saved, diagnose, de-hum, de-click, de-clip, spectral repair, de-noise plus high-pass, special problems, then level and export. Only run the tools the diagnosis actually called for.

• Which tools did you skip because the diagnosis did not call for them?

• Which step made the single biggest improvement to this recording?

• After bypass-comparing to the original, are you confident you improved it rather than just changed it?

Worksheet: Delivery Loudness and Export Plan

Plan the finishing stage for one file before exporting, matching the loudness target and format to the destination.

Destination (podcast / YouTube / broadcast / music streaming)

Target integrated loudness (LUFS)

True peak ceiling (dBFS)

Measured integrated LUFS before leveling

Gain or limiter applied to reach target

Archival master format (WAV sample rate / bit depth)

Delivery file format (MP3 kbps and mono/stereo, or WAV)

Export spot-check passed? (Y/N)

Checklist: Final Quality-Control and Delivery Checklist

[ ] Whole file auditioned start to finish on headphones
[ ] Repaired moments re-checked specifically for artifacts
[ ] Bypass A/B confirms the processed version is genuinely better
[ ] Checked on a second and third system (phone, laptop speaker)
[ ] No watery speech, lisping, thinness, or pumping remains

[ ] Integrated loudness hits the destination target with peaks at minus 1 dBFS
[ ] Archival 24-bit WAV master saved
[ ] Delivery file exported in the correct format and spot-checked on playback

Your Action Plan

1. Install iZotope RX (Elements is enough) and Audacity, and add the free Youlean Loudness Meter
2. Enable spectrogram view and practice naming defects on three different problem recordings
3. Save a flat 24-bit WAV master and commit to always working on a duplicate copy
4. Remove mains hum on a real clip with narrow notches and RX De-hum without thinning the voice
5. Run an automatic de-click pass for crackle, then manually repair the remaining loud clicks
6. Rescue a clipped recording with De-clip and rebalance the peaks below 0 dBFS
7. Dial in broadband noise reduction to the sweet spot (6 to 12 dB) plus an 80 Hz high-pass, with no watery artifacts
8. Spectral-repair at least one isolated one-off noise (cough, buzz, or squeak) with a tight selection
9. Build and save a reusable restoration chain in the proven order of operations
10. Restore one recording end to end, run the QC pass on three systems, then level to minus 16 LUFS and export both a WAV master and a delivery file