

APU Harmonic DJ



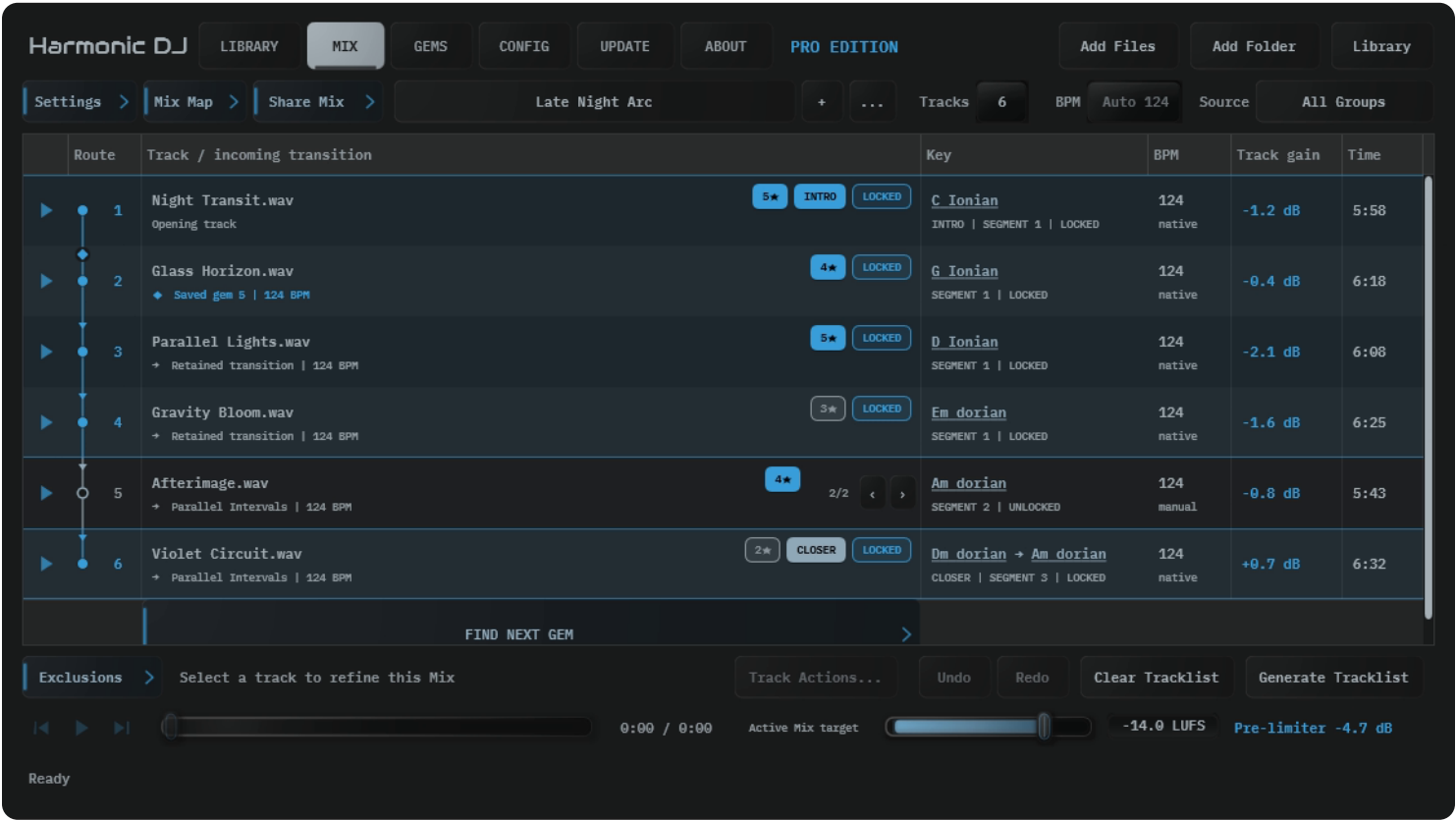
User Manual
v1.3.4

Table of Contents

Table of Contents	2
1. Introduction	4
2. Getting Started	5
2.1. Install and Launch	5
2.2. Use Harmonic DJ in a DAW	5
2.3. Appearance and Interface Size	5
2.4. Create Your First Library	7
2.5. Create Your First Mix	7
3. Library	8
3.1. Adding and Analyzing Audio	8
3.2. Browsing and Auditioning	8
3.3. Correcting BPM	9
3.4. Personal Track Ratings	9
3.5. Key Profiles and Key Guide	10
3.6. Library Groups	10
3.7. Library Maintenance	10
4. Mix	12
4.1. Mix Documents	12
4.2. Building a Tracklist	12
4.3. Refining a Tracklist	13
4.4. Mix Map	13
4.5. Audition and Gain Guidance	14
4.6. Share Mix	15
5. Mix Settings	16
5.1. Mix Settings Presets	16
5.2. Transition Profiles and Presets	17
5.3. Relation Rules and Rule Builder	18
5.4. Key Detection and Matching	18
5.5. Allowed Keys	19
5.6. BPM Matching and Allowances	19
5.7. Search Quality and Harmonic Detail	19
6. Gem Finder and Saved Gems	21
6.1. Finding a Next Gem	21
6.2. Candidate Selection and Placement	21
6.3. Saving and Rating Gems	22
6.4. Browsing and Reusing Gems	22
7. Concepts and Theory	23
7.1. Keys, Modes, and Parent Keys	23
7.2. Incoming and Outgoing Evidence	23
7.3. Directed Harmonic Relationships	24
7.4. Contours and Confidence	24
7.5. BPM, Pitch, and Gain	24
8. Sharing, Files, and Privacy	25
8.1. Shared Collections	25
8.2. Library Metadata	25
8.3. Mix and Preset Files	25
8.4. Playlist Exchange	25
8.5. Publishing a Mix	26
8.6. Remote Tracks and Find Online	26
8.7. Privacy	27
9. Community and Pro	28
9.1. Community	28
9.2. Pro	28
9.3. Trial and License Changes	28
10. Troubleshooting and Reference	29
10.1. Track States	29

10.2. Generation and Candidate Problems	29
10.3. Audio and M4A Playback	29
10.4. Cancellation and Recovery	29
10.5. Glossary	30
11. Credits	31
11.1. MIT License (r8brain)	31
11.2. FFTPACK License (pffft)	31
11.3. Mozilla Public License 1.1 (TagLib)	32
11.4. Boost Software License 1.0 (utf8cpp)	40

1. Introduction



APU Harmonic DJ analyzes a local music library and helps turn it into directed transitions and complete tracklists. It combines key and BPM detection with modal relationships, full harmonic evidence, gain guidance, and the transitions you personally save as Gems.

The basic workflow is simple: add music to the **Library**, create or generate a **Mix**, audition the transitions that matter, and save the strongest directed pairings as **Gems**. Harmonic DJ can do the routine searching while leaving the final musical decision where it belongs: with the listener.

Harmonic DJ is local-first. Audio analysis and audition happen on your computer. Shared collections contain path-free metadata and analysis rather than commercial audio, and a Mix document does not contain the audio files referenced by its tracklist.

Start with [Getting Started](#) for a first tracklist using the release defaults. The later sections explain how to refine a Mix, use Gem Finder, create custom transition profiles, and exchange metadata with another Harmonic DJ user.

2. Getting Started

A first useful result does not require any theory or custom configuration. Add a representative folder, let its tracks finish analyzing, and generate a Mix with the defaults. This gives us something musical to react to before changing the rules.

2.1. Install and Launch

Install Harmonic DJ using the package for your platform. The application and plug-ins are one matched installation and must use the same Harmonic DJ version.

- macOS includes the universal standalone application, VST3, Audio Unit, and AAX.
- Windows includes the standalone application, VST3, and AAX in both x64 and x86 packages.
- Linux x64 includes the standalone application and VST3. Linux plug-in host qualification is deferred; the current release-validation focus is macOS and Windows.

Keep the standalone application installed even if you primarily use a plug-in. It is a required installer component because it owns the shared Library database, scanning, and analysis work used by every plug-in instance. A host may scan the plug-in without opening the application; opening a plug-in editor connects to the Library and can start the application with its window hidden when necessary. Choose **Manage in App** to show that same application process for Library changes.

The application starts in Community unless a Pro trial or paid license is active. Community does not require an account or activation. Open **About** when you want to start a Pro trial or activate an existing license. Visit the [APU Harmonic DJ](#) product page to see current Pro pricing or purchase Pro.

On Windows N and KN editions, Harmonic DJ requires the Microsoft Media Feature Pack. The installer checks for the underlying Media Foundation components and can open Windows Optional Features when they are missing.

2.2. Use Harmonic DJ in a DAW

Add Harmonic DJ as an effect on a stereo audio track. The plug-in passes the host track through while its preview player is idle. Opening the editor connects it to the Library owned by the installed Harmonic DJ application; scanning or restoring a project without opening the editor does not need to show the application.

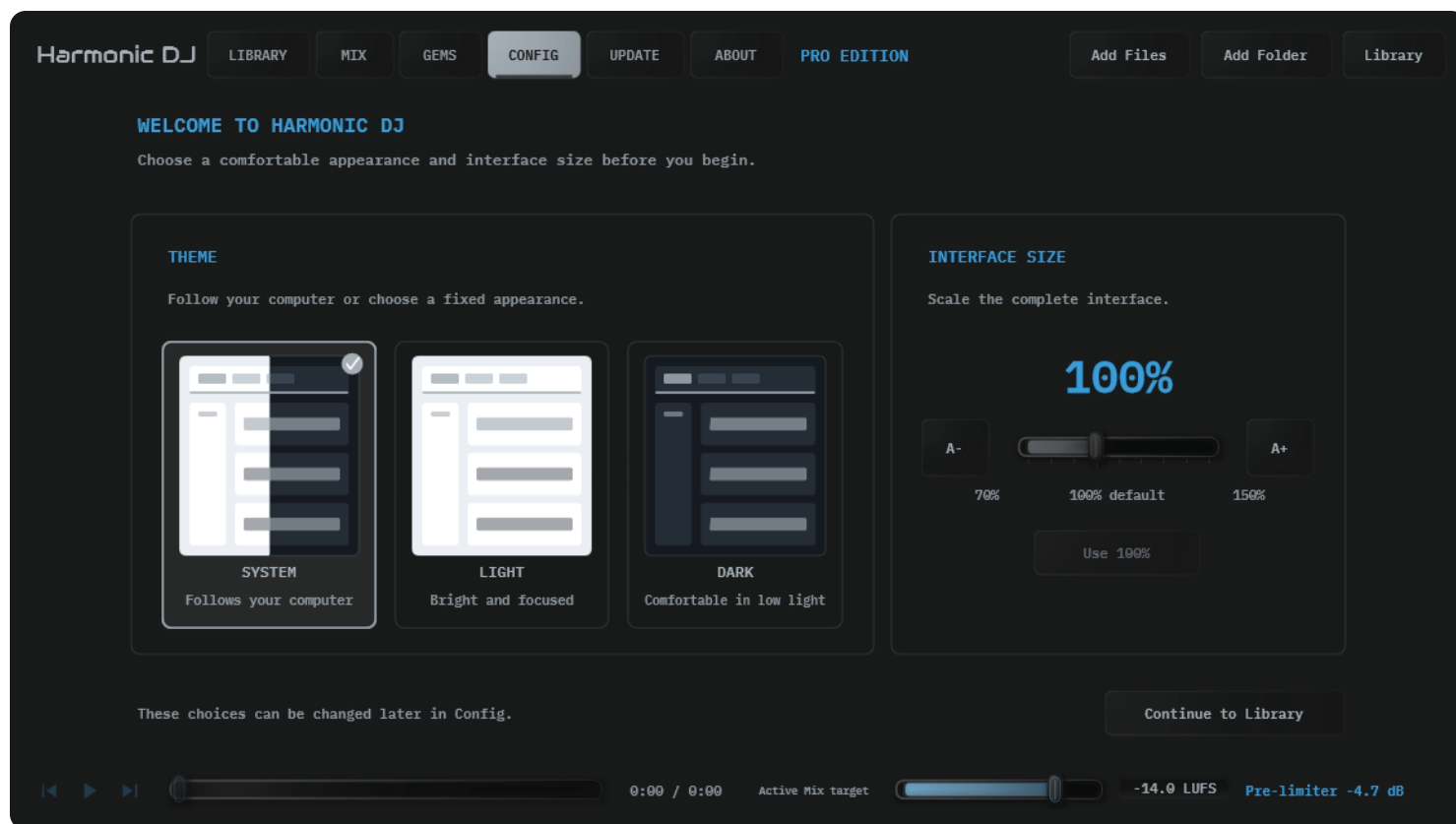
Each plug-in instance owns an independent Mix saved inside the DAW project. Closing and reopening the editor keeps that Mix alive, and reopening the DAW project restores its current revision. A plug-in Mix is not a live reference to whichever named Mix is open in the standalone application. Several instances can use the same shared Library while keeping their Mixes independent.

Library management remains in the application. Use **Manage in App** when you need to add, remove, rescan, or organize tracks. Library changes then become visible to connected plug-ins. If the application stops while a plug-in is open, the plug-in reconnects after the application returns. A version-mismatch message means the application and plug-ins came from different releases; update or reinstall the complete Harmonic DJ package together.

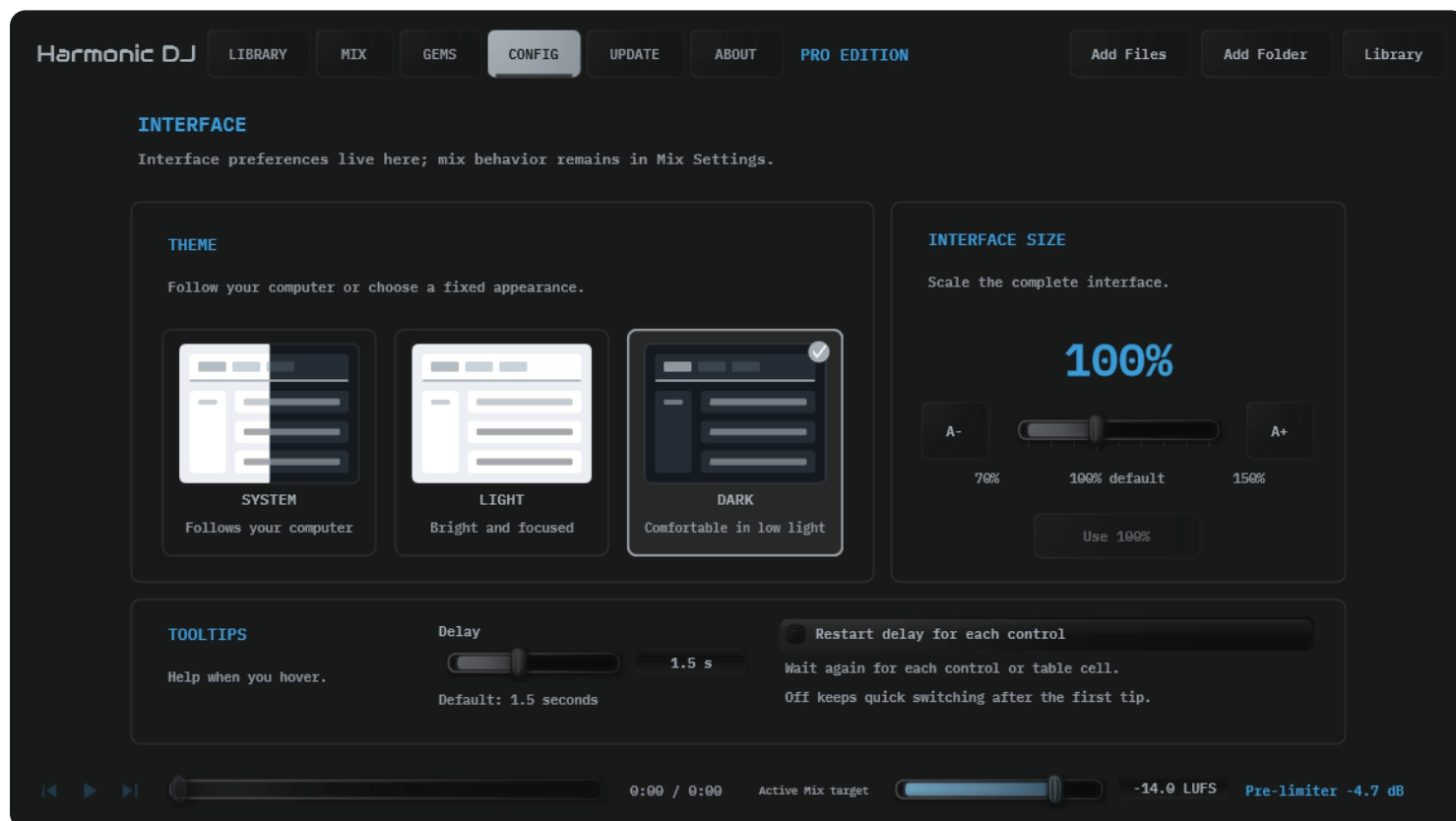
Preview plays through the plug-in's host output. Local tracks can be dragged from Harmonic DJ into a host arrangement.

When **Host BPM** is enabled and the host supplies tempo, Harmonic DJ uses that value for Mix planning and audition rate in the current instance. It falls back to the Mix BPM when host tempo is unavailable. Host BPM does not add a beat grid, quantized start, downbeat detection, phrase alignment, or time stretching.

2.3. Appearance and Interface Size



On first launch, Harmonic DJ opens a one-time appearance setup before the Library. Choose an appearance and a comfortable interface size, then select **Continue to Library**. You can change both choices later in **Config**. If an earlier Harmonic DJ version already saved a Light or Dark preference, setup selects that preference automatically so continuing performs the migration without changing how the application looks.



Open **Config**, immediately to the left of **About**, for application-wide appearance settings. Config is separate from Mix Settings: changing the theme or interface size affects the application, while Mix Settings contains the musical planning rules saved with one Mix.

Choose **System** to follow the operating system's current light or dark appearance. Harmonic DJ updates while it is open when the system setting changes. Choose **Light** or **Dark** for a fixed appearance that does not follow the operating system. The selection is saved globally and restored the next time Harmonic DJ opens.

Interface Size scales the complete application from 70% to 150% in 10% steps, preserving the layout instead of enlarging individual labels. Use **A-**, **A+**, the slider, or **Use 100%** to restore the original size. While you drag the slider, the percentage preview follows the selected value; Harmonic DJ resizes once when you release it.

2.4. Create Your First Library

1. Open the **Library** workspace.
2. Choose **Add Folder** and select a folder containing music, or use **Add Files** for a smaller first pass.
3. Leave Harmonic DJ open while it discovers and analyzes the supported files.
4. Use the **Ready to mix** filter when you only want to see tracks with completed key and BPM analysis.
5. Select a track and use the playback control to audition it.

Analysis can run across several tracks at once. The Library remains usable while work continues, and completed results survive cancellation. If a scan is interrupted, Harmonic DJ resumes the durable queue the next time the application opens.

A few dozen stylistically related tracks within a compatible BPM range are enough to learn the default workflow. Tracks spread across unrelated tempo ranges may not form a complete route with the default General Purpose profile and Same Mix BPM rule. Use Gem Finder to investigate individual pairs, or add more tracks near the BPM range you want to mix.

2.5. Create Your First Mix

1. Open **Mix**.
2. Leave **Source** on **All Groups**, or choose the Library groups that should supply candidates. Library browsing filters do not change this selection.
3. Leave **Tracks** at five and **BPM** on Auto.
4. Open **Settings** within Mix and confirm the release defaults: **Benchmark-Guided Modal**, **Start / end keys**, **Prefer same start / end**, **General Purpose**, **Same Mix BPM**, **Auto** search quality, and harmonic detail enabled.
5. Return to the tracklist and choose **Generate Tracklist**.
6. Audition the result. Lock anything you want to keep, replace an alternative, or exclude a poor fit, then generate again.

See [Building a Tracklist](#) for reusable group and imported-playlist workflows.

Community uses the same named, auto-saved Mix workflow as Pro, with exact track counts from one through five. Pro adds larger Mixes, Gem Finder, and saved Gems.

The generated route is a starting point, not a claim that every transition is ready to perform unchanged. Rhythm, phrasing, energy, cue points, and transition treatment still need musical judgment.

3. Library

Harmonic DJ

LIBRARYMIXGEMSCONFIGUPDATEABOUTPRO EDITION

Add FilesAdd FolderLibrary

Q

All FoldersAll tracksAll GroupsECMA-418 (Precise)K-System (83 dB SPL)10 tracks

Track	Rating	Key	BPM	Duration
▶ Afterimage.wav Club Set · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_	★★★★☆	09D · <u>A dorian</u> 90% confidence	124 Manual correction	5:43
▶ Arc Runner - Neon Tide.wav Club Set · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_	★★★★★	01D · <u>E dorian</u> 95% confidence	124 96% confidence	6:14
▶ Aster Vale - Dawn Relay (Radio Edit).wav Warmup · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_s_	★★★★☆	09D · <u>A dorian</u> 86% confidence	124 92% confidence	5:50
▶ Glass Horizon.wav Club Set · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_	★★★★☆	09B · <u>G Ionian</u> 88% confidence	124 92% confidence	6:18
▶ Gravity Bloom.wav Club Set · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_	★★★☆☆	01D · <u>E dorian</u> 89% confidence	124 91% confidence	6:25
▶ Mira Vector - Midnight Current.wav Warmup · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_s_	★★★★☆	11M · <u>E Mixolydian</u> 87% confidence	124 94% confidence	6:01
▶ Night Transit.wav Club Set · C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj_	★★★★★	08B · <u>C Ionian</u> 91% confidence	124 94% confidence	5:58
▶ Parallel Lights.wav		10R · <u>D Ionian</u>	124	

◀▶⏮⏭⏯⏸

0:00 / 0:00

Active Mix target

-14.0 LUFS

Pre-limiter -4.7 dB

ReadyAdd to TracklistShow in FolderRescanRemove

The Library is the analyzed source collection used by Mix, Gem Finder, and saved Gems. It keeps local file locations, track metadata, analysis results, groups, and track status in one local database. Removing a Library entry does not delete its audio file.

3.1. Adding and Analyzing Audio

Use **Add Files**, **Add Folder**, or drag supported audio into Harmonic DJ. Folder discovery includes supported files beneath the selected folder and adds them to a durable analysis queue.

One analysis pass collects file and tag metadata, BPM, integrated loudness, level information for gain matching, and harmonic evidence for every selectable key contour. Because the underlying evidence is retained, changing the active contour or reference SPL does not decode the audio again.

Cancel asks the active discovery, library operation, or analysis queue to stop cooperatively. The track currently being analyzed may restart later, while already completed tracks remain available.

The file chooser advertises the formats supported by the current platform. These normally include common WAV, AIFF, FLAC, Ogg Vorbis, and MP3 files. AAC and ALAC in M4A containers use Media Foundation on Windows and Core Audio on macOS, so M4A is only advertised where that native decoder is available.

3.2. Browsing and Auditioning

Search matches file information, identity metadata, and detected key labels. Add **bpm:128** or **bpm: 128** to find tracks that round to 128 BPM, **bpm:120-130** for an inclusive range of rounded tempos, or comparisons such as **bpm:>=128** and **bpm:<130**. Decimal places narrow the match: **bpm:128.0** matches values rounding to 128.0, and **bpm:128.25** narrows to two decimal places. The same precision rule applies to range endpoints and comparisons. BPM filters use the track’s current BPM, including manual corrections, and omit tracks without a BPM. Combine text and filters, for example **Artist Name bpm:128**; multiple BPM filters must all match.

Click a column heading to sort, and use the filter beside the search field to focus on:

- **All tracks**
- **Ready to mix**
- **Excluded from mix**
- **Needs attention**
- **Missing files**
- **Favorites (4-5 stars)**

Select a local track to audition it. The transport at the bottom of the application is shared across Library, Mix, Gems, and Gem Finder, so playback continues to feel like one listening session while you move between workspaces.

Imported collection tracks can participate in metadata-only planning but do not have local audio. Harmonic DJ identifies them as shared tracks instead of presenting them as broken local files.

The sortable **Rating** column shows your private 1-5 star preference. Click a star to rate one track, click its current rating again to clear it, or use **Personal Rating** in the track menu to rate the complete selection.

Right-click a track for Mix placement actions, **Personal Rating**, **BPM Correction**, **Move to Group**, **Find Online**, **Show in Folder**, **Rescan**, and **Remove from Library**.

Choose **Insert After Selected Track and Lock** when a Mix track is selected, or **Add to End of Tracklist and Lock** otherwise. With one Library track and one Mix track selected, **Replace Selected Track and Lock** replaces that Mix track. These actions lock your choices so later generation keeps them. In the Mix track menu, choose **Unlock Track** or **Unlock Selected Tracks** to allow replacement.

3.3. Correcting BPM

Tempo detection is an estimate, and rhythmically ambiguous material can produce a half-time, double-time, or otherwise incorrect result. In the standalone APU Harmonic DJ application, double-click a local track's **BPM** cell or open **BPM Correction** → **Correct BPM** from its track menu. Enter a value from 40 through 300 BPM. The same menu offers **Halve BPM**, **Double BPM**, and **Reset to Detected BPM** when those actions apply. Half and double use each track's current BPM, including an existing correction.

To correct a batch, search for **bpm:128**, press Enter to focus the results, and use Ctrl+A on Windows or Command+A on macOS to select all matching rows. Right-click the selection and choose **BPM Correction** → **Correct BPM** to set every selected track to 64, or choose **Halve BPM**. The menu shows the selection count. All selected tracks must be analyzed local tracks, and half/double actions are disabled if any result would fall outside 40-300 BPM. A batch is saved together; cancellation or an invalid value leaves the whole batch unchanged. Tracks that no longer match the search disappear after the edit completes.

A correction does not overwrite the detector result. The BPM cell identifies a **Manual correction**, and its tooltip shows both the BPM Harmonic DJ uses and the original detected BPM with its confidence. Resetting removes the correction and immediately returns to the latest detector result.

The corrected value becomes the track's used BPM everywhere: Library search and sorting, readiness, Mix targeting and generation, Gem Finder, BPM-aware audition playback, saved-Gem evidence, shared collections, and published Mix data. Key and loudness analysis are unchanged.

Corrections are tied to the SHA-256 identity of the complete local file. They survive rescanning unchanged audio, moving an unambiguously matched byte-identical file, removing and later re-adding the same file content, and Library Metadata backup/restore. If any file bytes change—including tag edits or transcoding—the old correction no longer applies, so review the new detector result and correct it again if necessary. Shared collections and published Mixes carry the BPM used for planning, but do not expose the private correction record or stale detector confidence.

3.4. Personal Track Ratings

Track ratings express how much you want a song to recur in your own mixes. **5 stars** means you love it, **4 stars** marks another favorite, **3 stars** and **Unrated** are neutral, and **1-2 stars** ask Harmonic DJ to use the track less often without excluding it.

Ratings are a soft preference after the hard musical and Mix rules. They can choose a favorite when otherwise-eligible routes are close, and they refine same-key alternatives and Gem Finder ordering. They never override exclusions, Allowed Keys, BPM requirements, transition-rule priority, a stronger saved-Gem rating, or any other eligibility constraint.

Ratings are available in both Community and Pro. Local and imported shared tracks can both be rated, and their rating is visible read-only in Mix and Gem Finder. The preference survives rescanning and later reimport of the same track path. A byte-identical moved file also keeps its rating when Harmonic DJ can relink it as described in [Library Maintenance](#).

Ratings are private. Your path-based **Library Metadata** backup includes them, but shared collections and published Mix pages do not. A recipient can assign an independent rating to a shared track after import.

3.5. Key Profiles and Key Guide

The contour and reference-SPL controls choose the active key profile. That choice belongs to the active Mix and is used consistently by Library, Mix, Gems, and Gem Finder.

ECMA-418 is the release default. **None** uses calibrated-flat evidence. **ISO 226:2003** and **ISO 226:2023** are phon-dependent profiles, so their result also depends on the selected reference SPL. Switching between these profiles is immediate because the scan already retained the required harmonic evidence.

Open **Key Guide** from a detected key to compare Major/minor character or the six supported advanced modes across all twelve tonic roots. The guide can preview matching local Library tracks and add or replace a Mix track. It is an exploration surface, not a second analysis mode.

3.6. Library Groups

Library groups are local organizational labels. Use the group selector to show **All Groups**, **Ungrouped**, one local group, or a group inside an imported shared collection.

Choose **Library** → **Manage Groups** to create, rename, reorder, or delete local groups. Deleting a group keeps its tracks and returns them to Ungrouped. Select one or more local tracks and use **Move to Group** to change their membership.

The Library group selector only changes what is visible in the Library. In Mix, **Source** independently chooses which groups can supply candidates for generation and alternative-track choices. Each Mix saves its own source, and applying a Mix Settings preset keeps that selection. See [Building a Tracklist](#) for a reusable group workflow.

Library → **Import Playlist** adds local audio referenced by an M3U or M3U8 file and asks which group to assign. Unchanged, successfully analyzed files reuse their analysis. **Export Selected Tracks as Playlist** and **Export Current View as Playlist** write the displayed track order to an M3U file. The current view includes its search, group, and other filters. See [Playlist Exchange](#) for the complete workflow.

3.7. Library Maintenance

Rescan analyzes the selected local tracks again. Use it after replacing an audio file, after a prior analysis error, or when a future detector revision specifically requires new analysis. A **Correcting BPM** value remains active when the complete file content is unchanged; changed bytes produce a new content identity and stop applying the old correction.

When a local file has moved and its old path no longer exists, add the byte-identical file from its new location. Harmonic DJ compares a SHA-256 hash of the complete file with missing Library records. One unambiguous match keeps the track's stable identity, earlier analysis while reanalysis runs, group, personal rating, and directed Gems. The open Mix replaces the old path and auto-saves; other saved Mixes keep working through the old-path alias and replace it when you open them. This works when the move happened while Harmonic DJ was closed because the missing Library record remains available as the matching anchor.

Matching is deliberately conservative. If the old file still exists, the second path is treated as a separate copy. If several missing records have identical content, Harmonic DJ does not guess which one moved. Editing tags, transcoding, or otherwise changing any file bytes creates a different hash and therefore does not auto-link.

Pending discovery records file metadata without reading track contents. When a worker starts a track, it reads the complete file to establish its content identity, immediately analyzes the audio, then reads the complete file again to record the final identity. Each worker therefore performs hash, analysis, and final hash in per-track sequence instead of hashing a whole import before analysis. Ordinary browsing, opening saved Mixes, and application startup do not rescan file contents.

Remove from Library removes the selected local records without deleting audio. Personal ratings and saved directed Gems keep their old path context, so they reconnect if that same path is added again later. Removing the record also removes the content-matching anchor; add a moved file first if you want automatic relinking.

Remove Missing Files searches the local Library for paths that no longer exist and asks before removing those records. Re-add moved files from their new location before using this cleanup so Harmonic DJ can recognize them. Shared collection tracks are not treated as missing because they intentionally have no local path.

Export Library Metadata writes a local JSON backup containing file paths, analysis state, personal ratings, and manual BPM corrections.

Import Library Metadata restores that path-based metadata on a compatible system. Use [Shared Collections](#) instead when sending analysis to another person.

4. Mix

Route	Track / incoming transition	Key	BPM	Track gain	Time
1	Night Transit.wav Opening track	C Ionian INTRO SEGMENT 1 LOCKED	124 native	-1.2 dB	5:58
2	Glass Horizon.wav ◆ Saved gem 5 124 BPM	G Ionian SEGMENT 1 LOCKED	124 native	-0.4 dB	6:18
3	Parallel Lights.wav → Retained transition 124 BPM	D Ionian SEGMENT 1 LOCKED	124 native	-2.1 dB	6:08
4	Gravity Bloom.wav → Retained transition 124 BPM	Em dorian SEGMENT 1 LOCKED	124 native	-1.6 dB	6:25
5	Afterimage.wav → Parallel Intervals 124 BPM	Am dorian SEGMENT 2 UNLOCKED	124 manual	-0.8 dB	5:43
6	Violet Circuit.wav → Parallel Intervals 124 BPM	Dm dorian → Am dorian CLOSER SEGMENT 3 LOCKED	124 native	+0.7 dB	6:32

A Mix combines a tracklist with the exact planning choices used to create it. The track order, locks, exclusions, target track count, BPM, group scope, key profile, transition profile, loudness target, and other Mix Settings travel together.

Harmonic DJ ranks complete routes by improving the weakest accepted transition first. This keeps several strong transitions from averaging away one poor connection. Your personal track ratings then provide a bounded preference among eligible choices without weakening the Mix constraints.

Open [Mix Map](#) from any non-empty Mix to see that ordered route across circle-of-fifths roots and all six supported modes.

4.1. Mix Documents

Mixes are named, auto-saved documents in both Community and Pro. Use the Mix browser to search and switch documents, + to start a blank Mix, and the ... menu to duplicate, rename, delete, import, or export.

New Mix starts with an empty tracklist and the default selected in [Mix Settings Presets](#). Factory Settings is the initial default. **Duplicate Mix** preserves the complete current document. Switching Mixes restores each document's own tracklist and strategy.

Undo and redo store complete, user-named document revisions. They remain available after a clean relaunch, and a new change after undo replaces the redo branch in the usual way.

Community can create and manage any number of Mix documents. A Mix containing more than five tracks stays readable and auditionable in Community, but it is read-only until Pro becomes active again. You can still create or open another Mix with five or fewer tracks.

4.2. Building a Tracklist

Choose the candidate pool with **Source**, set **Tracks** to the exact number of positions you want, choose a Mix BPM or leave it on Auto, then choose **Generate Tracklist**. Community accepts one through five tracks; Pro accepts larger counts too.

Two workflows help narrow the candidates:

- **Reusable Library groups:** In Library, use **Library** → **Manage Groups** to create a group. Select the tracks you want and choose **Move to Group**. Return to Mix, click **Source**, and choose that group or a combination of groups. **All Groups** includes grouped and ungrouped Library tracks. See [Library Groups](#) for group management.
- **Imported playlist:** Export your candidates as an M3U or M3U8 from DJ software, then choose **Mix** → ... → **Import Playlist**. This creates a new Mix in playlist order, with unlocked tracks and **Source** set to **Imported Playlist**. Wait for new audio to finish analysis, adjust **Tracks** if needed, and generate. Removing a row keeps that track in the candidate pool. See [Playlist Exchange](#) for import and export details.

Library search, group, and readiness filters only affect browsing. Generation and alternative-track choices use the Mix's **Source**, plus explicitly locked tracks, and still apply the usual BPM, key, and exclusion rules. Each Mix saves its source independently; applying a Mix Settings preset keeps it. For an imported Mix, click **Source** to switch between **Imported Playlist** and **Library Groups** without losing the imported pool.

Auto BPM follows the marked intro track, falls back to the first track, or lets the first generated track establish the target for an empty Mix. A typed value fixes the Mix target between 40 and 300 BPM. All Same Mix BPM modes round that target for planning and display while retaining the entered value. Ignore BPM bypasses the target and both BPM allowances.

You can also build manually. Select ready tracks in Library and use **Add After** when a Mix track is selected, or **Add to Tracklist** otherwise. Library add, insert, and replace actions lock the chosen tracks so generation keeps them. Use **Unlock Track** or **Unlock Selected Tracks** in the Mix track menu to allow replacement. Manually extending a tracklist beyond the current target automatically raises the target so authored positions are not discarded. You can also drag local track rows out to a DAW.

Mark one track as the intro or closer when that role matters. Those roles constrain the corresponding position during later generation without turning musical duration into a route-length estimate.

4.3. Refining a Tracklist

Select or right-click Mix rows to refine a result:

- **Lock Track** or **Lock Selected Tracks** keeps your chosen tracks and their order within each locked sequence. Full generation may move the sequence; tracks marked as Intro or Closer stay pinned to the beginning or end.
- **Unlock Track** or **Unlock Selected Tracks** allows generation to replace those tracks. Unlocking also clears any Intro or Closer role on them.
- **Replace with Another Track** steps through compatible alternatives for one position.
- **Regenerate This Segment** searches the unlocked region around the selected position while keeping its locked boundaries.
- **Remove Without Excluding** removes a track but allows it to return later.
- **Exclude from This Position, This Segment, or Entire Mix** records where the track should not return.
- **Exclusions** reviews and removes those rules without changing the current tracklist.

Explicitly locked tracks remain authored choices even if a later settings change would not select them automatically. New generated positions still have to satisfy the current constraints.

Same-key alternatives put higher-rated tracks first. A compact star badge in the tracklist shows the current personal rating without turning it into Mix document state.

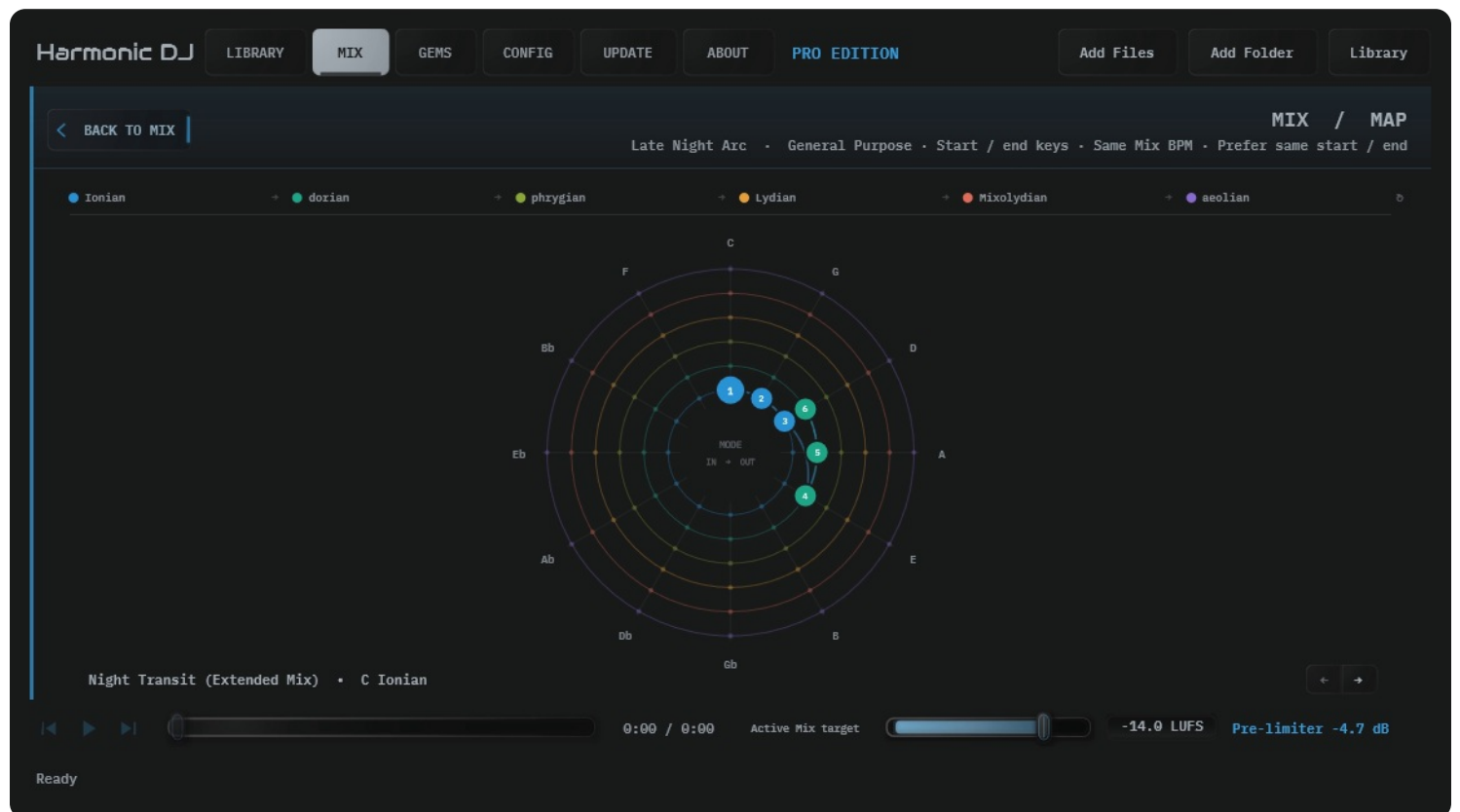
Each incoming transition keeps the explanation and settings context captured when that exact directed pair was authored. Changing the transition profile, key profile, key-matching scope, or BPM strategy therefore does not relabel earlier work. Hover a Mix row to review its origin and original context; if the current settings evaluate it differently, that comparison remains secondary tooltip detail. Replacing either endpoint creates a new edge, while moving an intact locked sequence keeps its existing explanations.

Open [Mix Map](#) after refining a route to inspect its complete harmonic trajectory without changing the tracklist.

Clear Tracklist removes the current tracklist, locks, and exclusions. It keeps the Mix name, target track count, planning settings, and audio Library.

4.4. Mix Map

Choose **Mix Map** from the Mix toolbar to open a read-only view of the current track order. It is available in Community and Pro whenever the current Mix is non-empty. Selecting anything in the map changes only the highlighted track and route; it never reorders tracks or changes Mix settings.



Read the map from angle, radius, and route:

- **Angle shows the root.** Roots advance clockwise around the circle of fifths, with C at the top.
- **Radius shows the mode.** The six lanes progress outward through Ionian, dorian, phrygian, Lydian, Mixolydian, and aeolian, then wrap from aeolian back to Ionian.
- **Numbered nodes show tracks.** Each number marks that track's incoming or start key. The selected track is drawn larger and its title and key appear along the bottom of the page.
- **Solid routes show transitions.** A solid segment connects the previous track's outgoing key to the next track's incoming key. The selected transition is emphasized and points toward its destination.
- **Dashed routes show movement within a track.** When a track starts and ends in different keys, its numbered start node connects to a small outlined end marker.

Tracks that share one start key fan out around a common hub so every track number remains selectable. Choose a numbered node directly, choose the hub to cycle through that shared-key group, or use the left and right buttons beside the title to move through the complete tracklist.

The Mix Map describes the authored route; it is not a transition score. Use it to recognize steady modal progressions, parallel movement, circle-of-fifths motion, repeated keys, and deliberate returns that are harder to see in a table. Return to the Mix tracklist when you want to edit, audition, regenerate, or share the result.

4.5. Audition and Gain Guidance

Each analyzed Mix row shows a signed track-gain recommendation. This matches the track to a fixed ECMA-based reference and does not change when other tracks are added or removed. That stability makes it practical to copy the individual values into a DAW.

The **Active Mix target** sets the desired integrated loudness for the complete Mix. Harmonic DJ calculates one common **pre-limiter gain** from the gain-adjusted track average. Changing the target or tracklist changes this common value without rewriting the individual track recommendations.

Harmonic DJ applies both values during audition so playback follows the active Mix target. It does not write processed audio, add a limiter, or make transition-treatment decisions for you.

Track gain is post-planning advice. It never changes whether a route or transition is accepted.

4.6. Share Mix

Harmonic DJ

LIBRARY MIX GEMS CONFIG UPDATE ABOUT PRO EDITION

Add Files Add Folder Library

MIX / SHARE

Review the public Mix details, recording, and copy-ready tracklist.

BACK TO MIX

Mix title
General Purpose Arc

DJ / creator (optional)
APU Demo DJ

Recording URL (optional)
https://soundcloud.com/...

Tracklist details
Automatic from tags, then filename. Select a track to edit this Mix only.

01 Sable North - Slow Orbit (Dub Mix)
Em dorian • 124.2 BPM

02 Arc Runner - Neon Tide - Share Edit
Em dorian • 124.0 BPM

Luma Drift - Gravity Bloom (Original Mix)

Artist Sable North

Title Slow Orbit (Dub Mix)

Use Automatic

Copy-ready tracklist
Includes the Mix title, creator, tracklist, and link.

General Purpose Arc
by APU Demo DJ

Tracklist
01. Sable North - Slow Orbit (Dub Mix)
02. Arc Runner - Neon Tide - Share Edit
03. Luma Drift - Gravity Bloom (Original Mix)
04. Arc Runner - Afterimage (Club Mix)
05. Aster Vale - Dawn Relay (Radio Edit)
06. Sable North - Violet Circuit

Not published

Copy Tracklist Publish Mix

Ready

0:00 / 0:00 Active Mix target -14.0 LUFS Pre-limiter -4.7 dB

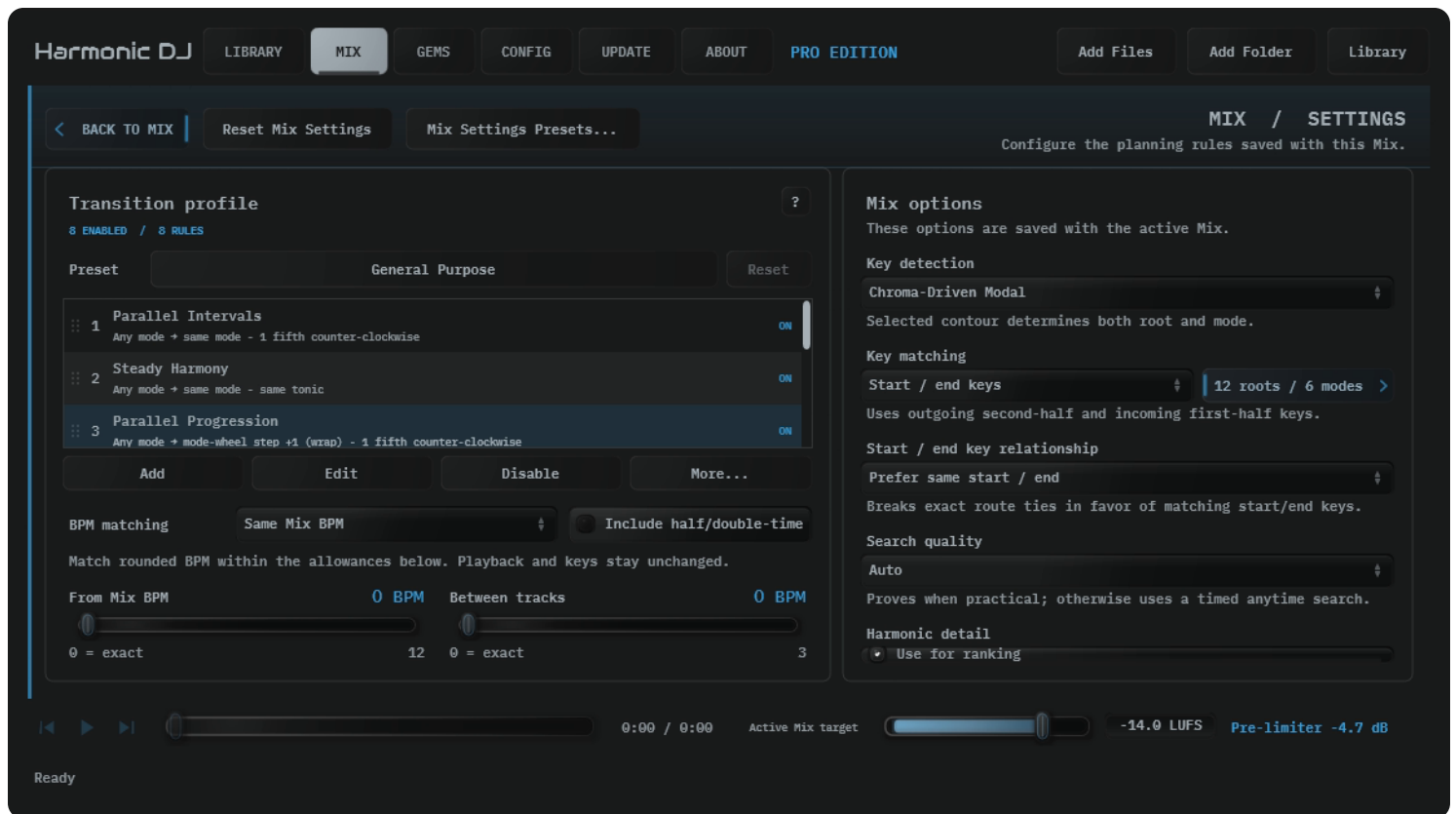
Share Mix prepares listener-facing details without changing the working tracklist. Enter a public Mix title and optional DJ or creator byline, then review the artist and title selected for each track.

Track display names start with embedded tags and fall back to conservative filename parsing. Corrections made here belong to this Mix only; they do not rewrite the audio file or global Library metadata.

Copy Tracklist copies the exact plaintext preview, including the Mix title, creator, ordered tracks, and appropriate link. Before publication the footer points to Harmonic DJ; once the current snapshot is published, it points to that Mix's permanent page. This workflow does not upload audio.

Copied and published transition explanations come from the settings that authored each edge, not whichever profile is currently selected. A tracklist completed under several transition profiles is labeled **Iterative** and names them; private current-settings comparisons are not published.

5. Mix Settings

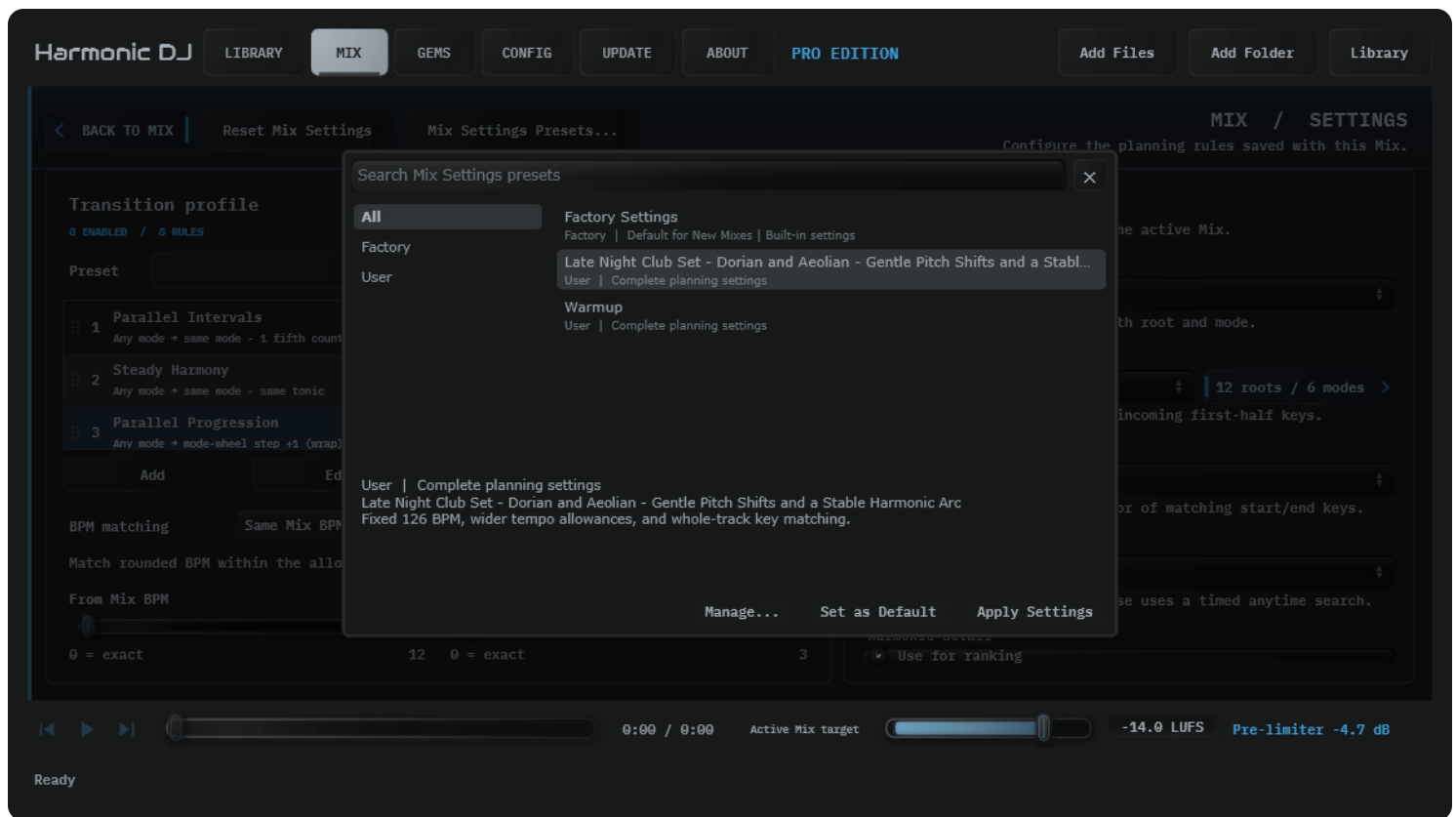


Mix Settings contains the planning rules saved with the active Mix. It is separate from the application-wide **Config** workspace, which controls theme and interface size. The example above uses Chroma-Driven Modal; detector choice belongs to the Mix, so another Mix can still use Benchmark-Guided Modal. **Reset Mix Settings** returns the whole page to the release defaults: Benchmark-Guided Modal detection, ECMA-418, the General Purpose transition preset, start/end matching, a preference for stable tracks, Same Mix BPM, Auto search quality, and harmonic-detail ranking.

Mix Settings Presets... opens the preset browser for complete planning setups. Save profiles for different situations, select one, and choose **Apply Settings** to copy it into the active Mix. Your candidate selection and tracklist stay with that Mix.

Change one idea at a time and listen to complete Mixes. A focused transition preset is much easier to understand when the other constraints remain steady.

5.1. Mix Settings Presets



Open **Mix Settings Presets...** at the top of Mix Settings. This browser uses the same search and management controls as Mixes and transition presets.

Under **Manage**, choose **Save Current Mix Settings As...**, then enter a name and optional description. A complete preset includes key detection and contour/reference settings, transition rules, allowed keys, key matching and start/end relationship, BPM strategy and allowances, Auto or fixed Mix BPM, search quality, harmonic detail, and the loudness target.

Select a preset and choose **Apply Settings** to copy those settings into the active Mix. This creates one undo step. The Mix keeps its name, target track count, selected groups, imported-playlist selection, tracklist, locks, exclusions, and sharing details. New generation uses the applied settings; existing track placements and their authored transition explanations remain intact.

Factory Settings restores the built-in planning setup while keeping that same Mix context. A transition preset in the Transitions panel copies only the transition profile; a complete Mix Settings preset also includes the other planning controls and targets.

Choose **Set as Default** beside **Apply Settings** to use the selected profile whenever you create a blank Mix or import a playlist. The browser marks it **Default for New Mixes**, and the choice survives relaunch. The button is disabled when the selected profile is already the default. Selecting Factory Settings with this action restores the built-in default. Setting a default leaves the active Mix and its undo history intact; use **Apply Settings** to change that Mix.

New Mixes copy the selected profile's latest saved settings. Updating the profile affects future Mixes, while deleting the default profile restores Factory Settings. The same default supplies a blank Mix when there are no saved Mixes or when you delete the final Mix. Duplicates and imported `.hdjmix` documents retain their own settings.

To replace a saved setup, select a user preset and choose **Update Selected User Preset**. **Edit Selected User Preset...** changes its name and description, and **Delete Selected User Preset...** removes it. Updating or deleting a preset leaves existing Mixes with their own copied settings. Factory Settings cannot be edited or deleted.

Preset application, saving, and updating follow the active Mix's editing access. Community Mixes with up to five tracks can use these controls; Pro also allows larger Mixes.

5.2. Transition Profiles and Presets

A **transition profile** is the ordered set of enabled relation rules used to accept directed harmonic edges. The first enabled rule that matches a transition supplies its priority and primary explanation.

General Purpose enables eight default rules in priority order: Parallel Intervals, Steady Harmony, Parallel Progression, Steady Progression, Parallel Brightening, Steady Brightening, Parallel Darkening, and Steady Darkening. The first four remain the core relationships, the two non-wrapping Brightening rules are lower-priority fallbacks, and the two reverse-direction Darkening rules are the final fallbacks for constrained libraries. The factory catalog also includes a focused preset for each relationship.

Four additional focused presets let you audition transitions with roots a tritone, or six semitones, apart:

- **Tritone Intervals** keeps the exact detected mode.
- **Tritone Progression** advances through Ionian → dorian → phrygian → Lydian → Mixolydian → aeolian → Ionian, skipping unsupported locrian on the wrap.
- **Tritone Brightening** moves through phrygian → aeolian → dorian → Mixolydian → Ionian → Lydian without wrapping.
- **Tritone Darkening** follows that brightness sequence in reverse, also without wrapping.

Every factory preset retains all twelve editable rules. General Purpose leaves the four Tritone rules disabled; each focused preset enables only its same-named rule. Apply a Tritone preset to test one relationship, or enable selected Tritone rules alongside your preferred existing rules and save a user preset.

Applying a transition preset copies its complete profile into the active Mix without changing the other planning settings or targets. The Mix keeps that snapshot, so later edits or deletion of a user preset cannot silently rewrite an older Mix. Use **Mix Settings Presets...** for a complete planning setup.

Factory presets are immutable. Pro users can save the active profile as a user preset, then update, rename, describe, import, export, or delete that reusable entry.

5.3. Relation Rules and Rule Builder

Each relation rule describes one or more accepted source-to-destination relationships. A rule can constrain source and destination modes, source and destination tonics, or a destination tonic movement relative to the source.

Use **Add** for a new rule, **Edit** to open Rule Builder, **Enable/Disable** to change the selected rules, and drag rows to set priority. **Reset** restores General Purpose. Duplicate and delete remain under **More**.

Rule Builder expresses alternatives rather than a hidden script. Common relationships take one alternative, for example, the same mode with a destination root five semitones higher. More specific ideas can enumerate modes or tonics, use steps from the source mode, or combine several alternatives inside one named rule.

Saving the rule applies its complete current definition to the Mix. Canceling a changed form asks before discarding edits. At least one relation rule must remain enabled so the profile always has a usable harmonic meaning.

5.4. Key Detection and Matching

Benchmark-Guided Modal is the default detector projection and supports Ionian, dorian, phrygian, Lydian, Mixolydian, and aeolian. **Benchmark Major / minor** provides a conventional two-mode view. **Chroma-Driven Modal** retains the earlier modal projection for comparison.

Start / end keys compares the detected second half of the source track with the first half of the destination. This is the default because a transition is directional: the outgoing part of one track meets the incoming part of another.

Whole-track key combines both analyzed halves in proportion to their duration, detects one key, and uses it at both boundaries. When whole-track matching is active, the separate start/end relationship control is not used.

With start/end matching, the relationship control can require, prefer, ignore, discourage, or require a key change within each track. Preferences are soft tie-breakers after transition quality; requirements filter newly selected tracks.

5.5. Allowed Keys

Allowed Keys filters roots and modes independently across the complete Mix. Every root and every supported mode is enabled by default.

A track is eligible only when both its effective start key and effective end key use an enabled root and mode. With pitch-shifted playback, the effective keys include the same target-relative semitone shift used for audition.

These are global membership constraints, not transition rules. Locked positions, Gem Finder placements, and saved Gems cannot bypass them. At least one root and one mode must remain enabled.

5.6. BPM Matching and Allowances

Same Mix BPM compares rounded whole BPMs within the allowances below. Tracks keep their original playback speed and keys. The Mix table displays the rounded BPM, with the detected decimal available in the tooltip.

Same Mix BPM + pitch shifts also allows speed changes in the selected semitone range. Choose **+/-1 semitone** or **+/-2 semitones** directly under **Pitch range**; the second choice includes one-semitone changes too. Each track uses the allowed adjustment that brings its rounded effective BPM closest to the Mix target; equally close choices prefer less pitch change. Rounded playback ratios must remain within five cents of the selected semitone step. Keys shift with playback before Allowed Keys and transition matching are evaluated.

Same Mix BPM + keylock uses the same two BPM allowances as Same Mix BPM, comparing each track's original rounded tempo before keylock. Eligible native-ratio tracks are planned for playback at the Mix BPM while preserving their original keys; half/double-time matches use the corresponding physical deck tempo shown in the tooltip. HDJ previews at the original speed and key, so you can judge harmonic flow before performing the tempo changes in your DJ software. The Mix table shows the authoritative BPM used to derive the comparison, with **keylock** underneath; its tooltip identifies the planned tempo.

Include half/double-time tracks is available with every Same Mix BPM strategy and is off by default. It also compares each authoritative rounded track BPM at twice and half its value, so a 61 BPM track can match a 122 BPM Mix as half-time and a 244 BPM track can match it as double-time. The selected relationship is contextual to this Mix target: Harmonic DJ does not relabel the track, rewrite its BPM, or change playback speed merely because of the ratio. With pitch shifts, only the independently selected semitone adjustment changes audition speed and key. With keylock, the tooltip shows both the physical planned tempo and its Mix-BPM equivalent.

Same Mix BPM and **Same Mix BPM + keylock** both apply the sliders to original rounded BPM after any enabled target-relative normalization. **Same Mix BPM + pitch shifts** applies them after normalization and the selected pitch shift: a 120 BPM track shifted to 127 BPM and an unshifted 127 BPM track have zero effective BPM difference. In keylock mode, those tracks retain their original 7 BPM gap for selection, so a Between tracks allowance of 3 rejects the pair even when both could eventually play at the Mix BPM.

From Mix BPM allows each track to sit above or below the Mix target by up to 12 BPM. **Between tracks** allows consecutive tracks to differ by up to 3 BPM. For example, at Mix BPM 128, an overall allowance of 4 admits effective tempos from 124 through 132, while a between-track allowance of 2 requires smaller steps through that range.

The sliders are linear and move in whole BPM steps. Both start at **0**, meaning an exact rounded match. Values stay in fixed positions with no decimal places. A drag creates one undoable change; double-clicking restores zero.

Ignore BPM leaves playback unchanged and matches keys without requiring detected BPM. The half/double-time toggle and both allowances are hidden and ignored in this mode; their saved values return when any Same Mix BPM mode is selected. The two Pitch range choices appear only in pitch-shift mode. Switching modes retains the selected half/double-time choice, pitch range, and both BPM allowances. **Reset Mix Settings** turns the ratio option off, and older Mix documents without the field load with it off.

Allowances include their boundaries and apply to generation, same-key replacements, and Gem Finder. Locks and saved Gems cannot bypass them during planning. Changing allowances keeps authored rows and their original transition explanations, while incompatible rows show **BPM limit** with details in their tooltips. Allowances, reset, undo, and redo are saved with the Mix.

For keylocked performance, enable keylock in your DJ software. An exported M3U playlist carries track order and audio paths; it does not set deck keylock or tempo. HDJ's keylock previews stay at the original tempo, while pitch-shift previews change speed and pitch together.

5.7. Search Quality and Harmonic Detail

Auto quickly supplies a good complete route, proves the best route when the remaining search is manageable, and otherwise continues as a bounded anytime search. The result reports whether it was proven optimal or was the best route found within that budget.

Optimal uses the same ordering and pruning but continues until the best route is proven or you cancel. It is most useful for a constrained Library or a final comparison where additional search time is acceptable.

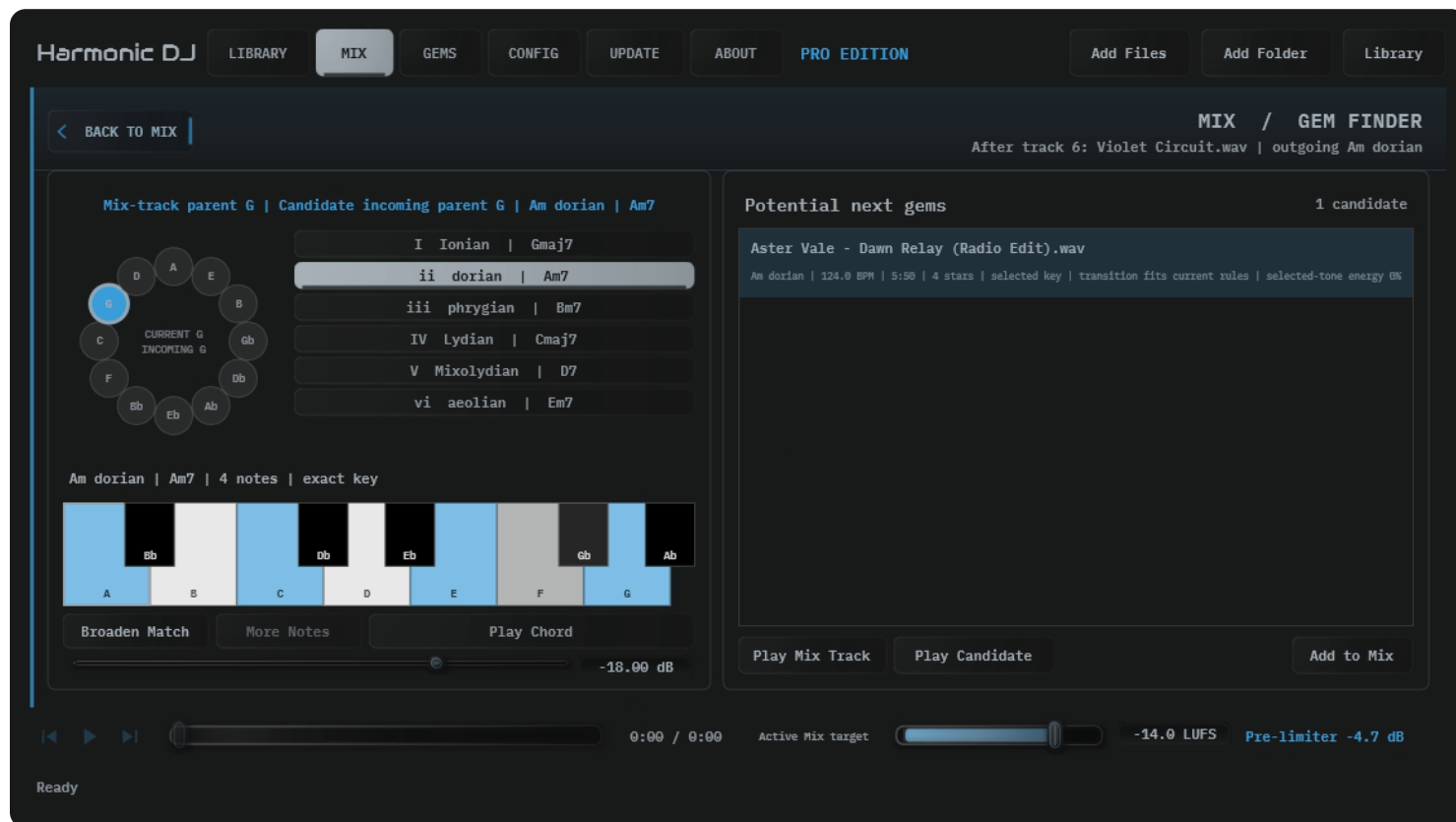
Harmonic detail reranks already accepted transitions using the fuller outgoing and incoming harmonic distributions. It does not make an otherwise rejected transition legal and is not presented as a probability that two songs will mix well.

Route comparison sorts transition quality from weakest to strongest. Harmonic DJ improves the weakest transition first, then the next weakest. Personal ratings contribute only a bounded preference below transition-rule and saved-Gem rating steps; track-level preferences, analysis confidence, and preservation of the current slot resolve the remaining ties.

6. Gem Finder and Saved Gems

Automatic generation searches a broad relationship. Gem Finder starts from one outgoing track and lets us ask a much more specific musical question. Saved Gems preserve the directed answers that remain useful after listening.

6.1. Finding a Next Gem



Select a Mix track and choose **Find Next Gem** from its context menu. The same action appears after the final track, where it naturally means “find something that could follow this.” Gem Finder requires Pro and a usable outgoing key for the selected track.

The circle of fifths marks the Mix track’s outgoing parent key separately from the incoming parent key you are exploring. Choose an incoming parent key and one of the six supported modes to define an exact modal key. The piano shows the tonic seventh chord associated with that selection.

Play Chord sustains those pitches while you alternate between the Mix track and candidate tracks. The chord is a harmonic probe: it helps teach the selected color without pretending that Harmonic DJ knows the correct cue point, phrase alignment, or transition treatment.

6.2. Candidate Selection and Placement

The first query requires the exact selected root and mode. **Fewer** broadens the search to same-root analyzed modes that contain the complete chord, then removes one non-root chord tone at a time. **More** reverses those steps and eventually restores exact root-and-mode matching.

Potential Gems include unused Library tracks that satisfy the active Mix BPM rule, Allowed Keys, matching scope, and start/end relationship requirement. Mix groups and exclusions do not hide Gem Finder candidates; this keeps the ear-led search broader than automatic generation.

Exact selected-key realizations rank first. Within otherwise-close results, higher personal ratings surface earlier and each rated row shows its star count. For relaxed results, selecting a candidate updates the displayed incoming mode while keeping the chord root and currently required pitches intact.

Place the candidate after the source track, or replace the existing next track. Placement locks both the source and candidate so generation keeps the directed pair together, and records its local harmonic approval for that Mix. It does not save a Gem, approve the reverse direction, or relax BPM and Allowed Keys.

To let generation replace either track, select both rows in Mix and choose **Unlock Selected Tracks**.

6.3. Saving and Rating Gems

After placing and auditioning a strong pair, right-click the destination Mix row and choose **Save Incoming Transition as Gem**. The saved direction is the preceding source track into that destination track.

A Gem explicitly authorizes that exact directed harmonic edge even when the general transition profile would reject it. BPM, Allowed Keys, uniqueness, and other non-harmonic constraints still apply. Saving source → destination never implies destination → source.

Gem ratings use the same 1-5 star language as track ratings. Click a star to set the personal rating, click the current star again to clear it, or choose **Unrated** from **Personal Rating**. A higher rating may increase preference between otherwise feasible choices, but it remains separate from detector evidence.

6.4. Browsing and Reusing Gems

Harmonic DJ

LIBRARY

MIX

GEMS

CONFIG

UPDATE

ABOUT

PRO EDITION

Add Files

Add Folder

Library

Saved Gem Transitions

4 gems from 3 sources

Select a destination to manage its directed pair. Adding a pair to Mix locks both tracks.

	Directed relationship	Rating	Saved
▶	Gravity Bloom.wav 1 saved destination • C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj-showcase-gems\audio\Music\Luma Drift\Gravity Bloom\Gravi_		
▶	◆ → Arc Runner - Neon Tide.wav Saved gem Steady Harmony 124 BPM • ecma418	★★★★★	2026-10-03
▶	Night Transit.wav 2 saved destinations • C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj-showcase-gems\audio\Music\Aster Vale\Night Transit\Nigh_		
▶	◆ → Glass Horizon.wav Saved gem 124 BPM • ecma418	★★★★★	2026-10-03
▶	◆ → Aster Vale - Dawn Relay (Radio Edit).wav Saved gem 124 BPM • ecma418	★★★☆☆	2026-10-03
▶	Parallel Lights.wav 1 saved destination • C:\APU-Temp\runs\capture-20261003T145553Z-22708-dce358\capture-state\hdj-showcase-gems\audio\Music\Mira Vector\Parallel Lights\Pa_		
▶	◆ → Violet Circuit.wav	★★★★☆	2026-10-03

CLEAR GEMS...

REMOVE GEM

◀ ▶ ⏮ ⏭

0:00 / 0:00

Active Mix target

-14.0 LUFS

Pre-limiter -4.7 dB

Ready

The **GEMS** workspace groups destinations beneath each source track. Select a destination to inspect and manage the saved directed pair.

Pro can append the pair to Mix, insert it after the selected Mix track, or replace the complete Mix tracklist with the pair. Both tracks must still be available and satisfy the active Mix BPM and Allowed Keys.

Each placement locks both tracks so generation keeps the directed pair together. To allow replacement, select both rows in Mix and choose **Unlock Selected Tracks**. Unlocking the Mix tracks leaves the saved Gem in your collection.

Local rows can be dragged to a DAW. **Show Track in Library** and **Show Track in Folder** reconnect the saved evidence with its audio. Removing one Gem or clearing the complete collection never deletes audio, Library tracks, or Mix tracklists.

7. Concepts and Theory

Harmonic DJ exposes enough theory to explain and shape a result, but the theory is not the result. A detected relationship can make a pairing worth hearing; rhythm, phrasing, energy, arrangement, and taste still decide whether it becomes a useful transition.

7.1. Keys, Modes, and Parent Keys

A key label combines a tonic root with a mode. Benchmark-Guided Modal currently uses Ionian, dorian, phrygian, Lydian, Mixolydian, and aeolian. The minor-family mode locrian completes the traditional seven-mode pattern, but it is not part of detector-dependent planning in the initial release.

Each modal key can also be viewed through its parent Ionian pitch collection. Two modal keys may share a parent collection while emphasizing different tonics, or preserve one modal tonic while moving between parent collections. This is why one Major/minor or Camelot-style label cannot describe every relationship Harmonic DJ can express.

The guide below holds the pitch collection fixed to C Major's white keys and moves only the tonic. Start on the highlighted key, continue across the white keys, wrap at C when needed, and stop when the tonic returns an octave higher: C to C is Ionian, D to D is dorian, and so on.

Ionian 1st mode · starts on C

dorian 2nd mode · starts on D

phrygian 3rd mode · starts on E

Lydian 4th mode · starts on F

Mixolydian 5th mode · starts on G

aeolian 6th mode · starts on A

locrian 7th mode · starts on B THEORY ONLY

The circle of fifths in Gem Finder shows parent keys because it gives us a stable way to explore pitch collections while separately choosing the destination mode and modal tonic.

7.2. Incoming and Outgoing Evidence

Harmonic DJ analyzes the first and second complete halves of each track. In the default start/end matching scope, the first half supplies incoming evidence and the second half supplies outgoing evidence.

A directed transition therefore compares the source's outgoing key with the destination's incoming key. Reversing the tracks asks a different question and can produce a different result.

Whole-track matching recombines both halves by analyzed duration and classifies one key. It is useful when one stable summary is preferable, while start/end matching retains more information about how a track may enter and leave.

7.3. Directed Harmonic Relationships

A relation rule accepts a directed pair of modal states. It may preserve a root or mode, move a root by an interval or circle-of-fifths step, move between specific modes, or combine several alternatives.

The General Purpose profile prioritizes four useful corners: same or +5-semitone root movement crossed with same or next-mode movement. It then accepts Parallel and Steady Brightening as lower-priority fallbacks through phrygian → aeolian → dorian → Mixolydian → Ionian → Lydian without wrapping. Parallel and Steady Darkening follow last through that sequence in reverse, giving constrained libraries another chance to form a complete Mix.

The opt-in Tritone rules use the corresponding mode relationships with a +6-semitone root move. Two tritone root moves return to the original pitch class, so Tritone Intervals alternates between two roots while keeping the mode fixed. Same-mode tritone scales share two of seven pitch classes; the actual overlapping phrases still decide whether a pairing sounds convincing. Audition each directed pairing and save successful transitions as Gems.

These names describe harmonic policy, not an automatic emotional arc. Library coverage, track arrangement, and the available graph determine what a complete Mix actually becomes.

7.4. Contours and Confidence

The key contour changes how frequency evidence contributes to detection and harmonic-detail ranking. None is calibrated-flat, ECMA-418 is the release default, and the two ISO 226 profiles vary with reference SPL.

The selected profile can change a derived key without rescanning because Harmonic DJ retains the underlying calibrated harmonic evidence. Gain analysis is separate and remains fixed so changing the key contour cannot move previously copied gain recommendations.

Key confidence is an uncalibrated separation heuristic: it describes how strongly the selected category separated from nearby alternatives inside the current model. It is useful context, not a promise of musical certainty and not a rejection threshold.

7.5. BPM, Pitch, and Gain

BPM is a Mix constraint rather than a reward. A track either satisfies the selected BPM policy or it does not. This prevents a harmonically strong but tempo-incompatible edge from slipping into a route through a weighted average.

When a local track has a [Correcting BPM](#) value, that value-not the retained detector estimate-is the source tempo for these constraints, Mix targeting, Gem Finder, and audition-rate calculations. The Library and Mix tooltips identify the correction and keep the detector result available for comparison.

Pitch-shifted playback changes speed and pitch together. Harmonic DJ transposes the track's effective keys and harmonic evidence by the same integer-semitone step used to reach the Mix BPM.

Gain guidance is also independent from route selection. Per-track ECMA-relative gain helps neighboring tracks meet at a stable subjective level, while the common pre-limiter gain places the complete adjusted Mix near its integrated-LUFS target.

8. Sharing, Files, and Privacy

Harmonic DJ separates local user state from portable metadata. Audio stays local unless you independently move or publish it through some other service.

8.1. Shared Collections

Export Collection creates a versioned `.hdjcollection` file from the complete local Library, Ungrouped, or the currently selected local group. Name the collection before choosing its destination.

The file contains stable collection and track identifiers, sender-defined groups, structured identity, the BPM used for planning, key evidence and derived profiles, and loudness analysis. Detector confidence is included when that BPM is the detector result. A manual correction is exported as the used BPM without exposing the sender's private correction record or stale detector confidence. The file excludes local paths, audio, personal ratings, Gems, Mix documents, and other private Library state.

Import Shared Collection adds that path-free snapshot as a named remote collection. Reimporting a newer export with the same collection and track identifiers updates the existing records instead of creating duplicates. Sender groups remain scoped beneath their collection.

Manage Shared Collections removes imported metadata without changing local tracks. Imported collections cannot currently be re-exported as if they were your own local collection.

8.2. Library Metadata

Export Library Metadata writes a path-based JSON snapshot intended for your own backup or transfer between compatible file layouts. Unlike a shared collection, it includes local file paths, personal ratings, manual BPM corrections, and other private Library state.

Import Library Metadata validates those paths and restores compatible records into the local database. It does not contain the audio itself, so the referenced files still need to exist at the stored locations.

Use `.hdjcollection` for friend-to-friend sharing. Use the Library metadata JSON when preserving your own local analysis and paths is the purpose.

8.3. Mix and Preset Files

A `.hdjmix` file contains the current Mix document: its track references, order, roles, locks, exclusions, target values, key profile, transition-profile snapshot, rules, authored incoming-transition explanations and context, sharing details, and other planning state. It does not contain audio, private undo history, or the live association with a published Mix page. Importing the file creates a new local Mix identity, so it cannot update or advertise the source Mix's published page. **Duplicate Mix** follows the same rule.

Exported transition presets contain a reusable transition profile. Applying one copies that profile into the active Mix; the Mix does not depend on the preset file remaining available later.

Mix import and export, along with transition-preset management, are available in Community. Imported Mixes with five or fewer tracks are editable there. Larger imported Mixes remain readable and auditionable until Pro is active. Imported Mixes and presets are validated before replacing local state. Keep exports alongside normal project backups when a tracklist or custom relationship is important.

8.4. Playlist Exchange

Use playlists to bring a local track selection from DJ software into Harmonic DJ and return the finished track order. Import accepts UTF-8 `.m3u` and `.m3u8` files, including relative paths and local file URLs. Export writes a UTF-8 `.m3u` containing absolute paths to the original audio. The audio must remain accessible on the importing computer; foreign Windows/macOS paths require relocation before import. Native Traktor NML is not supported.

Library → **Import Playlist** adds or reuses the referenced audio and uses the selected Library group. Choosing a group explicitly assigns existing imported tracks to that group too. **Mix** → ... → **Import Playlist** creates a new named Mix in the playlist's order using the default selected in [Mix Settings Presets](#) and keeps existing Library groups. Both queue analysis for new or changed audio and reuse successful analysis of unchanged files.

An imported Mix starts with unlocked tracks and retains the complete imported candidate pool when you remove or reorder rows. **Source** in the Mix toolbar displays **Imported Playlist**. Click it to switch to **Library Groups**, or return to the imported source later. Generation and alternative-track choices use the selected source; tracks you explicitly lock remain included. Library browsing filters do not change the Mix source. The usual BPM, key, and transition rules still apply. The source pool and selection are saved in the Mix document and its undo history. See [Building a Tracklist](#) for the candidate-selection workflows.

Mix → ... → **Export Playlist** writes the current authored order. Library export offers either selected rows or the current filtered view, in displayed order. Exports retain authored repetitions and require every track to have an available local audio file; missing files and path-free shared collection entries block the export. Import keeps the first occurrence of each file and reports duplicates, missing files, and unsupported entries before asking whether to import the available tracks.

Playlist exchange transfers file references and order. It does not transfer cue points, beat grids, HDJ analysis, playback processing, or Mix settings. Keep a `.hdjmix` file when preserving HDJ planning state. Playlist import/export is available in Community. An imported playlist with more than five tracks opens as a read-only Mix until Pro is active. Playlist audio import runs in the standalone application, where the Library is managed.

In DJ software that supports M3U exchange, export a playlist, import it into HDJ, refine the Mix, then export an M3U for import into that software. Accepting M3U8 input in HDJ does not establish M3U8 support in another application.

8.5. Publishing a Mix

Community and Pro can copy or publish any editable saved Mix. Open **Share** to review the exact title, optional DJ / creator byline, and track display names that will be public. Corrections made here belong to this Mix only. **Copy Tracklist** works without publishing and uses the Harmonic DJ product link until the current snapshot has its own page.

Choose **Publish Mix** to create that page. The first time this installation publishes, enter an email address. Harmonic DJ sends a review link; opening it shows the pending tracklist, and **Publish and view Mix** performs the actual publication. Merely opening the email does not publish anything. If the Share page remains open, it notices the confirmation automatically; **View Mix** and **Unpublish** then appear as outlined secondary buttons beside the publication status.

Successful confirmation also establishes a publishing credential on this computer. Later Mixes normally publish immediately without another email. If the credential is missing or rejected, Harmonic DJ asks for email verification again.

Editing a Mix never changes its public page by itself. After the first publication, the primary action becomes **Update Mix**; choosing it replaces the snapshot at the same canonical URL. Harmonic DJ stores the publication association with that saved Mix, so switching Mixes or restarting the application retains its published state. If email verification is required again, the existing version stays public until the reviewed update is confirmed. The page remains public until explicitly unpublished, and the linked copy-ready tracklist contains its permanent URL. Unpublishing permanently retires that URL; publishing the same local Mix again is allowed and creates a new URL.

Published pages contain visible tracklist and strategy details only. They never contain audio, local file paths, private Mix history, Library groups, locks, exclusions, or raw analysis evidence. Anyone with a published URL can view it, and the page may be indexed like an ordinary public web page.

When every published track has supported key information, the page also shows an interactive [Mix Map](#). Selecting a map node or its left and right buttons highlights the matching public tracklist row; pointing to, focusing, or choosing a tracklist row selects the same track in the map. This visualization uses the visible published key information and does not add private Library or analysis data.

Another Harmonic DJ user can choose **Library > Import Collection from Mix Link...** and paste the public URL to create a path-free shared collection from its public track information. This does not import the Mix itself, transfer publication ownership, or silently follow later updates.

8.6. Remote Tracks and Find Online

A shared track may appear as a planning candidate even when its audio is unavailable locally. Harmonic DJ keeps that state explicit instead of showing it as a missing file or silently removing it from discovery.

Choose **Library > Import Collection from Mix Link...** and paste a public Harmonic DJ Mix link to create a path-free shared collection from its public track information. This imports a collection, not the Mix itself. Importing the same link again explicitly refreshes that collection; Harmonic DJ does not follow later publication updates automatically. The public Mix page remains the reference for its authored order, transition explanations, and recording.

Imported Mix-link tracks use the key and BPM published with that Mix as discovery context for potential matches. This is not a substitute for analyzing the audio locally, so Harmonic DJ may report different keys after you obtain and add a track.

Find Online uses available identity metadata to open a MusicBrainz recording or search, a descriptive Beatport search, or a SoundCloud search. This is a lookup convenience rather than a purchasing, downloading, or matching service.

When you legally obtain the audio, add it through the ordinary Library workflow. The local track becomes the canonical playable record; there is no separate manual-link path that bypasses normal analysis.

8.7. Privacy

Commercial audio is not embedded in Library metadata, shared collections, Mix documents, transition presets, or published Mix pages. Harmonic DJ does not upload audio for license checks or proxy it between users.

Local Library paths remain local unless you deliberately use the path-based Library Metadata export. Shared collections are the path-free format intended for another person.

Share Mix corrections are stored with that Mix and do not rewrite source tags. Copying a tracklist places only the visible text on the clipboard. Publishing sends only the reviewed public snapshot. The email address is used to deliver verification and is not added to a newsletter or embedded in the page.

9. Community and Pro

Community and Pro use the same detector, key profiles, planner, saved Mix workflow, default ranking, and audio Library. Pro adds larger Mixes, Gem Finder, and reusable Gems.

9.1. Community

Community is free forever and does not require an account. It includes unlimited local analysis, Library search and management, personal track ratings, audition, key-profile selection, groups, local metadata, portable collection exchange, and the complete Settings surface.

It includes named, auto-saved Mix documents with exact track counts from one through five. You can create, rename, duplicate, import, export, undo, seed from Library, generate, lock positions, replace alternatives, remove tracks, apply exclusions, and regenerate.

Community can open the interactive [Mix Map](#), manage transition presets, copy or publish editable Mixes, and drag playable local tracks from Mixes and Gems into other applications. It can also open and audition existing Pro Mixes and Gems. A Mix with more than five tracks is read-only until Pro is active again.

9.2. Pro

Pro removes the five-track Mix limit and unlocks Gem Finder plus saving, rating, and reusing directed Gems.

Visit the [APU Harmonic DJ](#) product page to see current Pro pricing or purchase Pro.

9.3. Trial and License Changes

Open **About** to start the standard APU Pro trial or activate a license. The trial unlocks the same local features as paid Pro and does not require a payment card.

When a trial expires or a license becomes inactive, Harmonic DJ returns to Community. The Library, Gems, shared collections, transition presets, and Mix documents remain stored. Mixes with five or fewer tracks stay editable. Larger Mixes stay readable and auditionable, and become editable again when Pro is active.

If Pro access changes during generation of a Mix longer than five tracks, Harmonic DJ leaves the existing saved Mix unchanged rather than committing a partial result. A Community-sized generation can finish normally.

10. Troubleshooting and Reference

Start with the status line at the top of Harmonic DJ. Long operations report their current phase, and most rejected actions explain the specific requirement that was not met.

10.1. Track States

Ready to mix means the local track has the analysis required for planning. **Needs attention** collects incomplete or failed local analysis. Select the track to inspect its status, then use **Rescan** after correcting the underlying file or decoder problem.

Missing files are local records whose stored path no longer exists. If a file moved, add it from the new location before cleanup; one byte-identical, unambiguous content match updates the Library and saved Mix paths automatically. **Show in Folder** opens the last known parent when possible, and **Remove Missing Files** permanently cleans up the remaining records after confirmation.

A shared track is intentionally metadata-only. It can support planning and online lookup but cannot be auditioned or dragged as a local audio file.

10.2. Generation and Candidate Problems

Mix generation targets the requested track count. If it cannot fill every position, it keeps the longest compatible route it found, preferring the stronger route when lengths tie, as long as every lock is preserved.

The requested track count stays unchanged so another Generate can retry the full target after you adjust the Library or constraints. If no compatible progress can preserve the locks, the current tracklist is left unchanged.

Common causes of a partial or unchanged result include:

- Too few ready and unique tracks in the selected groups
- A focused transition profile with too few compatible edges
- A strict BPM rule or narrow pitch-shift range
- Allowed roots or modes that exclude most of the Library
- Required stable or changing start/end keys
- Locked positions that cannot be connected
- Position, segment, or whole-Mix exclusions

Gem Finder intentionally ignores Mix groups and exclusions, but it still requires an unused track that passes BPM, Allowed Keys, key matching, and any start/end relationship requirement. A shared candidate can be planned but not auditioned until local audio is added normally.

10.3. Audio and M4A Playback

If a local track will not analyze or play, confirm that the file still exists and appears in the Add Files chooser for the current platform. Then rescan the track and read the status message.

On Windows, AAC and ALAC M4A decoding depends on Microsoft Media Foundation. Windows N and KN editions normally require the Media Feature Pack from **Settings** → **Apps** → **Optional Features** followed by a restart. The Harmonic DJ installer checks for the required components and offers to open that settings page.

On macOS, M4A uses Core Audio. Linux builds advertise only the formats available through their registered readers.

10.4. Cancellation and Recovery

Canceling discovery, analysis, metadata transfer, or generation is cooperative. The current unit of work may take a moment to stop cleanly.

Completed Library analysis is retained. An interrupted current track returns to the durable queue. Canceling Mix generation leaves the previous tracklist in place.

Mix documents are auto-saved and keep bounded revision history. If the current projection needs repair after an interrupted write, Harmonic DJ can recover it from the saved history manifest without placing that private history inside an exported `.hdjmix` file.

10.5. Glossary

Allowed Keys: Independent root and mode filters applied to both boundaries of every eligible Mix track.

Gem: A saved, directed source-to-destination transition approved by the listener.

Harmonic detail: Soft reranking evidence derived from fuller harmonic distributions after a transition is already accepted.

Incoming / outgoing key: The detected key used where a track enters or leaves under start/end matching.

Mix: A tracklist plus the complete planning and sharing state used to create and refine it.

Mix Map: A read-only trajectory of Mix roots, modes, within-track key movement, and directed transitions.

Parent key: The Ionian pitch collection associated with a modal key.

Pre-limiter gain: One common gain recommendation that places the gain-adjusted Mix near its integrated-loudness target before final limiting.

Relation rule: One named directed harmonic predicate inside a transition profile.

Shared collection: A path-free, audio-free snapshot of track identity and analysis metadata.

Transition profile: The ordered collection of enabled relation rules owned by a Mix.

11. Credits

This software was developed by [APU Software, LLC](#) and is available as a standalone application and VST3 plug-in on Windows, macOS, and Linux; as Audio Unit on macOS; and as AAX on Windows and macOS. The software libraries below are utilized for portions of the software:

- [JUCE](#) (cross-platform audio and user interface framework)
- [Boost](#) (header-only algorithms)
- [r8brain](#) (sample rate conversion)
- [PFFFT](#) (FFT library)
- [TagLib](#) (audio metadata)
- [utf8cpp](#) (Unicode support used by TagLib)

11.1. MIT License (r8brain)

Copyright (c) 2013–2023 Aleksey Vaneev

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

11.2. FFTPACK License (pffft)

Copyright (c) 2013 Julien Pommier (pommier@modartt.com)
Based on original fortran 77 code from FFTPACKv4 from NETLIB,
authored by Dr Paul Swarztrauber of NCAR, in 1985.
As confirmed by the NCAR fftpack software curators, the following
FFTPACKv5 license applies to FFTPACKv4 sources. My changes are
released under the same terms.

FFTPACK license:

<http://www.cisl.ucar.edu/css/software/fftpack5/ftpk.html>

Copyright (c) 2004 the University Corporation for Atmospheric
Research ("UCAR"). All rights reserved. Developed by NCAR's
Computational and Information Systems Laboratory, UCAR,
www.cisl.ucar.edu.

Redistribution and use of the Software in source and binary forms,
with or without modification, is permitted provided that the
following conditions are met:

- Neither the names of NCAR's Computational and Information Systems
Laboratory, the University Corporation for Atmospheric Research,
nor the names of its sponsors or contributors may be used to
endorse or promote products derived from this Software without
specific prior written permission.
- Redistributions of source code must retain the above copyright
notices, this list of conditions, and the disclaimer below.
- Redistributions in binary form must reproduce the above copyright
notice, this list of conditions, and the disclaimer below in the
documentation and/or other materials provided with the
distribution.

THIS SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT
HOLDERS BE LIABLE FOR ANY CLAIM, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES OR OTHER LIABILITY, WHETHER IN AN
ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE
SOFTWARE.

11.3. Mozilla Public License 1.1 (TagLib)

MOZILLA PUBLIC LICENSE

Version 1.1

1. Definitions.

1.0.1. "Commercial Use" means distribution or otherwise making the
Covered Code available to a third party.

1.1. "Contributor" means each entity that creates or contributes to
the creation of Modifications.

1.2. "Contributor Version" means the combination of the Original
Code, prior Modifications used by a Contributor, and the Modifications
made by that particular Contributor.

1.3. "Covered Code" means the Original Code or Modifications or the
combination of the Original Code and Modifications, in each case

including portions thereof.

1.4. "Electronic Distribution Mechanism" means a mechanism generally accepted in the software development community for the electronic transfer of data.

1.5. "Executable" means Covered Code in any form other than Source Code.

1.6. "Initial Developer" means the individual or entity identified as the Initial Developer in the Source Code notice required by Exhibit A.

1.7. "Larger Work" means a work which combines Covered Code or portions thereof with code not governed by the terms of this License.

1.8. "License" means this document.

1.8.1. "Licensable" means having the right to grant, to the maximum extent possible, whether at the time of the initial grant or subsequently acquired, any and all of the rights conveyed herein.

1.9. "Modifications" means any addition to or deletion from the substance or structure of either the Original Code or any previous Modifications. When Covered Code is released as a series of files, a Modification is:

A. Any addition to or deletion from the contents of a file containing Original Code or previous Modifications.

B. Any new file that contains any part of the Original Code or previous Modifications.

1.10. "Original Code" means Source Code of computer software code which is described in the Source Code notice required by Exhibit A as Original Code, and which, at the time of its release under this License is not already Covered Code governed by this License.

1.10.1. "Patent Claims" means any patent claim(s), now owned or hereafter acquired, including without limitation, method, process, and apparatus claims, in any patent Licensable by grantor.

1.11. "Source Code" means the preferred form of the Covered Code for making modifications to it, including all modules it contains, plus any associated interface definition files, scripts used to control compilation and installation of an Executable, or source code differential comparisons against either the Original Code or another well known, available Covered Code of the Contributor's choice. The Source Code can be in a compressed or archival form, provided the appropriate decompression or de-archiving software is widely available for no charge.

1.12. "You" (or "Your") means an individual or a legal entity exercising rights under, and complying with all of the terms of, this License or a future version of this License issued under Section 6.1. For legal entities, "You" includes any entity which controls, is controlled by, or is under common control with You. For purposes of this definition, "control" means (a) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (b) ownership of more than fifty percent (50%) of the outstanding shares or beneficial ownership of such entity.

2. Source Code License.

2.1. The Initial Developer Grant.

The Initial Developer hereby grants You a world-wide, royalty-free, non-exclusive license, subject to third party intellectual property claims:

(a) under intellectual property rights (other than patent or trademark) Licensable by Initial Developer to use, reproduce, modify, display, perform, sublicense and distribute the Original Code (or portions thereof) with or without Modifications, and/or as part of a Larger Work; and

(b) under Patents Claims infringed by the making, using or selling of Original Code, to make, have made, use, practice, sell, and offer for sale, and/or otherwise dispose of the Original Code (or portions thereof).

(c) the licenses granted in this Section 2.1(a) and (b) are effective on the date Initial Developer first distributes Original Code under the terms of this License.

(d) Notwithstanding Section 2.1(b) above, no patent license is granted: 1) for code that You delete from the Original Code; 2) separate from the Original Code; or 3) for infringements caused by: i) the modification of the Original Code or ii) the combination of the Original Code with other software or devices.

2.2. Contributor Grant.

Subject to third party intellectual property claims, each Contributor hereby grants You a world-wide, royalty-free, non-exclusive license

(a) under intellectual property rights (other than patent or trademark) Licensable by Contributor, to use, reproduce, modify, display, perform, sublicense and distribute the Modifications created by such Contributor (or portions thereof) either on an unmodified basis, with other Modifications, as Covered Code and/or as part of a Larger Work; and

(b) under Patent Claims infringed by the making, using, or selling of Modifications made by that Contributor either alone and/or in combination with its Contributor Version (or portions of such combination), to make, use, sell, offer for sale, have made, and/or otherwise dispose of: 1) Modifications made by that Contributor (or portions thereof); and 2) the combination of Modifications made by that Contributor with its Contributor Version (or portions of such combination).

(c) the licenses granted in Sections 2.2(a) and 2.2(b) are effective on the date Contributor first makes Commercial Use of the Covered Code.

(d) Notwithstanding Section 2.2(b) above, no patent license is granted: 1) for any code that Contributor has deleted from the Contributor Version; 2) separate from the Contributor Version; 3) for infringements caused by: i) third party modifications of Contributor Version or ii) the combination of Modifications made by that Contributor with other software (except as part of the Contributor Version) or other devices; or 4) under Patent Claims infringed by Covered Code in the absence of Modifications made by that Contributor.

3. Distribution Obligations.

3.1. Application of License.

The Modifications which You create or to which You contribute are governed by the terms of this License, including without limitation Section 2.2. The Source Code version of Covered Code may be distributed only under the terms of this License or a future version of this License released under Section 6.1, and You must include a copy of this License with every copy of the Source Code You distribute. You may not offer or impose any terms on any Source Code version that alters or restricts the applicable version of this License or the recipients' rights hereunder. However, You may include an additional document offering the additional rights described in Section 3.5.

3.2. Availability of Source Code.

Any Modification which You create or to which You contribute must be made available in Source Code form under the terms of this License either on the same media as an Executable version or via an accepted Electronic Distribution Mechanism to anyone to whom you made an Executable version available; and if made available via Electronic Distribution Mechanism, must remain available for at least twelve (12) months after the date it initially became available, or at least six (6) months after a subsequent version of that particular Modification has been made available to such recipients. You are responsible for ensuring that the Source Code version remains available even if the Electronic Distribution Mechanism is maintained by a third party.

3.3. Description of Modifications.

You must cause all Covered Code to which You contribute to contain a file documenting the changes You made to create that Covered Code and the date of any change. You must include a prominent statement that the Modification is derived, directly or indirectly, from Original Code provided by the Initial Developer and including the name of the Initial Developer in (a) the Source Code, and (b) in any notice in an Executable version or related documentation in which You describe the origin or ownership of the Covered Code.

3.4. Intellectual Property Matters

(a) Third Party Claims.

If Contributor has knowledge that a license under a third party's intellectual property rights is required to exercise the rights granted by such Contributor under Sections 2.1 or 2.2, Contributor must include a text file with the Source Code distribution titled "LEGAL" which describes the claim and the party making the claim in sufficient detail that a recipient will know whom to contact. If Contributor obtains such knowledge after the Modification is made available as described in Section 3.2, Contributor shall promptly modify the LEGAL file in all copies Contributor makes available thereafter and shall take other steps (such as notifying appropriate mailing lists or newsgroups) reasonably calculated to inform those who received the Covered Code that new knowledge has been obtained.

(b) Contributor APIs.

If Contributor's Modifications include an application programming interface and Contributor has knowledge of patent licenses which are reasonably necessary to implement that API, Contributor must also include this information in the LEGAL file.

(c) Representations.

Contributor represents that, except as disclosed pursuant to Section 3.4(a) above, Contributor believes that Contributor's Modifications are Contributor's original creation(s) and/or Contributor has sufficient rights to grant the rights conveyed by this License.

3.5. Required Notices.

You must duplicate the notice in Exhibit A in each file of the Source Code. If it is not possible to put such notice in a particular Source Code file due to its structure, then You must include such notice in a location (such as a relevant directory) where a user would be likely to look for such a notice. If You created one or more Modification(s) You may add your name as a Contributor to the notice described in Exhibit A. You must also duplicate this License in any documentation for the Source Code where You describe recipients' rights or ownership rights relating to Covered Code. You may choose to offer, and to charge a fee for, warranty, support, indemnity or liability obligations to one or more recipients of Covered Code. However, You may do so only on Your own behalf, and not on behalf of the Initial Developer or any Contributor. You must make it absolutely clear than any such warranty, support, indemnity or liability obligation is offered by You alone, and You hereby agree to indemnify the Initial Developer and every Contributor for any liability incurred by the Initial Developer or such Contributor as a result of warranty, support, indemnity or liability terms You offer.

3.6. Distribution of Executable Versions.

You may distribute Covered Code in Executable form only if the requirements of Section 3.1-3.5 have been met for that Covered Code, and if You include a notice stating that the Source Code version of the Covered Code is available under the terms of this License, including a description of how and where You have fulfilled the obligations of Section 3.2. The notice must be conspicuously included in any notice in an Executable version, related documentation or collateral in which You describe recipients' rights relating to the Covered Code. You may distribute the Executable version of Covered Code or ownership rights under a license of Your choice, which may contain terms different from this License, provided that You are in compliance with the terms of this License and that the license for the Executable version does not attempt to limit or alter the recipient's rights in the Source Code version from the rights set forth in this License. If You distribute the Executable version under a different license You must make it absolutely clear that any terms which differ from this License are offered by You alone, not by the Initial Developer or any Contributor. You hereby agree to indemnify the Initial Developer and every Contributor for any liability incurred by the Initial Developer or such Contributor as a result of any such terms You offer.

3.7. Larger Works.

You may create a Larger Work by combining Covered Code with other code not governed by the terms of this License and distribute the Larger Work as a single product. In such a case, You must make sure the requirements of this License are fulfilled for the Covered Code.

4. Inability to Comply Due to Statute or Regulation.

If it is impossible for You to comply with any of the terms of this License with respect to some or all of the Covered Code due to statute, judicial order, or regulation then You must: (a) comply with

the terms of this License to the maximum extent possible; and (b) describe the limitations and the code they affect. Such description must be included in the LEGAL file described in Section 3.4 and must be included with all distributions of the Source Code. Except to the extent prohibited by statute or regulation, such description must be sufficiently detailed for a recipient of ordinary skill to be able to understand it.

5. Application of this License.

This License applies to code to which the Initial Developer has attached the notice in Exhibit A and to related Covered Code.

6. Versions of the License.

6.1. New Versions.

Netscape Communications Corporation ("Netscape") may publish revised and/or new versions of the License from time to time. Each version will be given a distinguishing version number.

6.2. Effect of New Versions.

Once Covered Code has been published under a particular version of the License, You may always continue to use it under the terms of that version. You may also choose to use such Covered Code under the terms of any subsequent version of the License published by Netscape. No one other than Netscape has the right to modify the terms applicable to Covered Code created under this License.

6.3. Derivative Works.

If You create or use a modified version of this License (which you may only do in order to apply it to code which is not already Covered Code governed by this License), You must (a) rename Your license so that the phrases "Mozilla", "MOZILLAPL", "MOZPL", "Netscape", "MPL", "NPL" or any confusingly similar phrase do not appear in your license (except to note that your license differs from this License) and (b) otherwise make it clear that Your version of the license contains terms which differ from the Mozilla Public License and Netscape Public License. (Filling in the name of the Initial Developer, Original Code or Contributor in the notice described in Exhibit A shall not of themselves be deemed to be modifications of this License.)

7. DISCLAIMER OF WARRANTY.

COVERED CODE IS PROVIDED UNDER THIS LICENSE ON AN "AS IS" BASIS, WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES THAT THE COVERED CODE IS FREE OF DEFECTS, MERCHANTABLE, FIT FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE COVERED CODE IS WITH YOU. SHOULD ANY COVERED CODE PROVE DEFECTIVE IN ANY RESPECT, YOU (NOT THE INITIAL DEVELOPER OR ANY OTHER CONTRIBUTOR) ASSUME THE COST OF ANY NECESSARY SERVICING, REPAIR OR CORRECTION. THIS DISCLAIMER OF WARRANTY CONSTITUTES AN ESSENTIAL PART OF THIS LICENSE. NO USE OF ANY COVERED CODE IS AUTHORIZED HEREUNDER EXCEPT UNDER THIS DISCLAIMER.

8. TERMINATION.

8.1. This License and the rights granted hereunder will terminate automatically if You fail to comply with terms herein and fail to cure such breach within 30 days of becoming aware of the breach. All sublicenses to the Covered Code which are properly granted shall

survive any termination of this License. Provisions which, by their nature, must remain in effect beyond the termination of this License shall survive.

8.2. If You initiate litigation by asserting a patent infringement claim (excluding declaratory judgment actions) against Initial Developer or a Contributor (the Initial Developer or Contributor against whom You file such action is referred to as "Participant") alleging that:

(a) such Participant's Contributor Version directly or indirectly infringes any patent, then any and all rights granted by such Participant to You under Sections 2.1 and/or 2.2 of this License shall, upon 60 days notice from Participant terminate prospectively, unless if within 60 days after receipt of notice You either: (i) agree in writing to pay Participant a mutually agreeable reasonable royalty for Your past and future use of Modifications made by such Participant, or (ii) withdraw Your litigation claim with respect to the Contributor Version against such Participant. If within 60 days of notice, a reasonable royalty and payment arrangement are not mutually agreed upon in writing by the parties or the litigation claim is not withdrawn, the rights granted by Participant to You under Sections 2.1 and/or 2.2 automatically terminate at the expiration of the 60 day notice period specified above.

(b) any software, hardware, or device, other than such Participant's Contributor Version, directly or indirectly infringes any patent, then any rights granted to You by such Participant under Sections 2.1(b) and 2.2(b) are revoked effective as of the date You first made, used, sold, distributed, or had made, Modifications made by that Participant.

8.3. If You assert a patent infringement claim against Participant alleging that such Participant's Contributor Version directly or indirectly infringes any patent where such claim is resolved (such as by license or settlement) prior to the initiation of patent infringement litigation, then the reasonable value of the licenses granted by such Participant under Sections 2.1 or 2.2 shall be taken into account in determining the amount or value of any payment or license.

8.4. In the event of termination under Sections 8.1 or 8.2 above, all end user license agreements (excluding distributors and resellers) which have been validly granted by You or any distributor hereunder prior to termination shall survive termination.

9. LIMITATION OF LIABILITY.

UNDER NO CIRCUMSTANCES AND UNDER NO LEGAL THEORY, WHETHER TORT (INCLUDING NEGLIGENCE), CONTRACT, OR OTHERWISE, SHALL YOU, THE INITIAL DEVELOPER, ANY OTHER CONTRIBUTOR, OR ANY DISTRIBUTOR OF COVERED CODE, OR ANY SUPPLIER OF ANY OF SUCH PARTIES, BE LIABLE TO ANY PERSON FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY CHARACTER INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, OR ANY AND ALL OTHER COMMERCIAL DAMAGES OR LOSSES, EVEN IF SUCH PARTY SHALL HAVE BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. THIS LIMITATION OF LIABILITY SHALL NOT APPLY TO LIABILITY FOR DEATH OR PERSONAL INJURY RESULTING FROM SUCH PARTY'S NEGLIGENCE TO THE EXTENT APPLICABLE LAW PROHIBITS SUCH LIMITATION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS EXCLUSION AND LIMITATION MAY NOT APPLY TO YOU.

10. U.S. GOVERNMENT END USERS.

The Covered Code is a "commercial item," as that term is defined in 48 C.F.R. 2.101 (Oct. 1995), consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212 (Sept. 1995). Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4 (June 1995), all U.S. Government End Users acquire Covered Code with only those rights set forth herein.

11. MISCELLANEOUS.

This License represents the complete agreement concerning subject matter hereof. If any provision of this License is held to be unenforceable, such provision shall be reformed only to the extent necessary to make it enforceable. This License shall be governed by California law provisions (except to the extent applicable law, if any, provides otherwise), excluding its conflict-of-law provisions. With respect to disputes in which at least one party is a citizen of, or an entity chartered or registered to do business in the United States of America, any litigation relating to this License shall be subject to the jurisdiction of the Federal Courts of the Northern District of California, with venue lying in Santa Clara County, California, with the losing party responsible for costs, including without limitation, court costs and reasonable attorneys' fees and expenses. The application of the United Nations Convention on Contracts for the International Sale of Goods is expressly excluded. Any law or regulation which provides that the language of a contract shall be construed against the drafter shall not apply to this License.

12. RESPONSIBILITY FOR CLAIMS.

As between Initial Developer and the Contributors, each party is responsible for claims and damages arising, directly or indirectly, out of its utilization of rights under this License and You agree to work with Initial Developer and Contributors to distribute such responsibility on an equitable basis. Nothing herein is intended or shall be deemed to constitute any admission of liability.

13. MULTIPLE-LICENSED CODE.

Initial Developer may designate portions of the Covered Code as "Multiple-Licensed". "Multiple-Licensed" means that the Initial Developer permits you to utilize portions of the Covered Code under Your choice of the NPL or the alternative licenses, if any, specified by the Initial Developer in the file described in Exhibit A.

EXHIBIT A -Mozilla Public License.

``The contents of this file are subject to the Mozilla Public License Version 1.1 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at <http://www.mozilla.org/MPL/>

Software distributed under the License is distributed on an "AS IS" basis, WITHOUT WARRANTY OF ANY KIND, either express or implied. See the License for the specific language governing rights and limitations under the License.

The Original Code is _____.

The Initial Developer of the Original Code is _____.

Portions created by _____ are Copyright (C) _____
_____. All Rights Reserved.

Contributor(s): _____.

Alternatively, the contents of this file may be used under the terms of the _____ license (the "[_____] License"), in which case the provisions of [_____] License are applicable instead of those above. If you wish to allow use of your version of this file only under the terms of the [_____] License and not to allow others to use your version of this file under the MPL, indicate your decision by deleting the provisions above and replace them with the notice and other provisions required by the [_____] License. If you do not delete the provisions above, a recipient may use your version of this file under either the MPL or the [_____] License."

[NOTE: The text of this Exhibit A may differ slightly from the text of the notices in the Source Code files of the Original Code. You should use the text of this Exhibit A rather than the text found in the Original Code Source Code for Your Modifications.]

11.4. Boost Software License 1.0 (utf8cpp)

Copyright 2006-2022 Nemanja Trifunovic

Boost Software License - Version 1.0 - August 17th, 2003

Permission is hereby granted, free of charge, to any person or organization obtaining a copy of the software and accompanying documentation covered by this license (the "Software") to use, reproduce, display, distribute, execute, and transmit the Software, and to prepare derivative works of the Software, and to permit third-parties to whom the Software is furnished to do so, all subject to the following:

The copyright notices in the Software and this entire statement, including the above license grant, this restriction and the following disclaimer, must be included in all copies of the Software, in whole or in part, and all derivative works of the Software, unless such copies or derivative works are solely in the form of machine-executable object code generated by a source language processor.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.