



TapeEngine

User Manual

Product Version	1.1
Platform	Windows x64
Formats	VST3
Licence	Permanently free

Installation, controls, creative workflows and reliable operation

photondsp.com

© 2026 PhotonDSP. All rights reserved.

Contents

01	Product Overview and Installation	3
02	Interface and Quick Start	4
03	Tape Character and Manual	5
04	Signal Flow and Tone & Saturation	6
05	Tape Motion	7
06	Stereo & Damage	8
07	Noise & Texture	9
08	Mix, Gain, Bypass and Metering	10
09	Presets and Project Recall	11
10	Factory Preset Guide	12
11	Practical Use and Troubleshooting	13

How to read this guide

Control names match the TapeEngine interface. Each module description explains both the audible result and the limits of the model. Hover over a label, knob or value in the plug-in for a shorter explanation.

TapeEngine is a creative, engineering-informed model. Its master scale describes increasingly imperfect recording systems; it is not a measurement standard or a replica of a named recorder, tape formulation or historical year.

Values and units

Percentages under effect knobs indicate the strength of that module. They do not mean measured distortion, speed error or physical damage. kHz, dB and microseconds have the specific meanings explained beside the relevant controls. In particular, noise dB values are generator gains, not measured output noise floors or signal-to-noise ratios. Active percentage values are rounded to whole numbers, with a displayed minimum of 1%. This affects the label only; processing retains the precise setting.

OFF means the minimum effect setting. At the HF Cut minimum-effect position, the low-pass is bypassed. Gain at 0.0 means unity gain, not OFF. Mix at OFF selects the dry branch; output Gain and Tape Dynamics can still affect that branch.

1. Product Overview and Installation

TapeEngine combines tape coloration, transport movement, stereo imperfections, damage and noise in one audio effect.

Twenty modules can be adjusted separately or together with Tape Character. Its automatic scale moves from clean digital audio through Premium, Ordinary, Worn Out and Broken conditions to deliberate chaos. Creative presets combine these properties independently.

This release

Product version	1.1
Platform / formats	Windows x64 / VST3
Audio layouts	Mono in/out or stereo in/out
Interface	Fixed 968 x 700 logical pixels
Licence	Permanently free, including commercial audio work

TapeEngine has no trial, serial number, activation, account sign-in or licence-server requirement. Once the files are on your computer, audio processing works offline. Website links and downloads require their own internet access.

Install the VST3

Close instances of TapeEngine before replacing its files. Copy the complete supplied .vst3 bundle folder, including its Contents subfolder, into the standard Windows VST3 directory:

```
C:\Program Files\Common Files\VST3\
```

A PhotonDSP subfolder is also suitable if your host scans subfolders. Refresh the DAW plug-in list. The effect appears as PhotonDSP TapeEngine. Use a 64-bit VST3 host; a 32-bit host cannot load this build directly.

Documentation and local storage

Help opens the Documentation folder; About > Licenses opens the Licenses folder. Choose the document and language there. Copy documents as described in the accompanying README, or use the optional Install Documentation.ps1 helper. If Windows blocks scripts, use Explorer instead; no security-policy change is needed.

```
%LOCALAPPDATA%\PhotonDSP\TapeEngine\Documentation  
%LOCALAPPDATA%\PhotonDSP\TapeEngine\Licenses
```

The preset bank is created automatically for the current Windows user under %APPDATA%\PhotonDSP\TapeEngine\Presets. Keep the documentation, licence and third-party notices with any permitted installation.

2. Interface and Quick Start



TapeEngine 1.1: clean starting state with Tape Dynamics enabled.

The header contains preset navigation, the preset menu, Save, Reset, Help and About. Tape Character sits above four groups of tape modules. Mix, Bypass, Gain, Tape Dynamics and the stereo meter occupy the right panel. The lower information strip describes the control under the pointer.

1. Press RESET to start from the automatic clean state: Tape Character 0%, Mix 100%, Gain 0 dB, Tape Dynamics on and all tape modules at minimum effect.
2. Play your source and move Tape Character slowly towards 10-35%. Keep Mix at 100% initially so you hear the processed path clearly.
3. Adjust Saturation, HF Cut or movement individually. An asterisk and + manual mark the customised relationship to the master control.
4. Compare with Bypass and use Gain to match listening level. Watch both output channels when adding Hum, Head Bump or strong saturation.
5. Try a creative preset, then save your own variation. Creative and user presets start at 0% + manual while retaining their sound.

Drag knobs vertically or use the mouse wheel. Double-click a knob to restore its default. Resetting an individual tape knob remains an individual edit; use RESET or select factory CLEAN IN/OUT for the clean automatic master map.

3. Tape Character and Manual

The cassette-shaped slider is the Tape Character master control. It coordinates all twenty tape modules; it is not a separate wet/dry control. Output Mix, Gain and Tape Dynamics remain independent.

Master	Automatic character after RESET
0%	Clean: all tape modules at minimum effect
10%	Premium recording system and good tape
35%	Ordinary: HF Cut 14 kHz; Head Bump +2.5 dB
60%	Worn Out: Head Bump +4 dB; Hum -24 dB
85%	Broken: Head Bump +5 dB; Hum -12 dB; HF Cut 7.5 kHz
100%	Deliberate chaos; every tape knob reaches its effect maximum

These are creative, engineering-informed conditions adjusted by listening, not certified recorder specifications. Values interpolate linearly in their stored units. Head Bump and Hum stay at maximum from 85% to 100%; other modules continue to change. At 100%, HF Cut reaches 5 kHz and Hiss -48 dB.

Colour guide

The value changes from white to gold over 0-15%, gold to warm orange over 15-30%, warm orange to coral over 30-45%, coral to soft red over 45-60%, and soft red to clear red over 60-85%. It stays red from 85% to 100%. Colour indicates character severity, not output clipping.

Individual edits

Changing a tape knob adds an asterisk to the master value and shows + manual. Further master movement retains the edit in proportion to the automatic curve. For example, changing an automatic 20% knob depth to 40% makes a later automatic 30% depth become 60%, until it reaches the knob limit.

That proportion is based on normalised knob travel, including knobs displayed in dB or kHz. It is not a multiplier of electrical voltage, noise amplitude or frequency. HF Cut travel is measured from the open end towards 5 kHz. Reaching a limit does not erase the correction.

Edits made at an automatic OFF point

A ratio to zero is undefined. TapeEngine instead remembers the manually chosen starting depth and progressively adds the remaining automatic range. A 40% starting depth followed by 50% automatic depth gives 70%: $40\% + (60\% \times 50\%)$. Returning the master to zero restores that starting sound.

Presets and RESET

Creative and user presets start at 0% + manual. Their knob settings become the starting sound, and moving the master adds character from there. Factory CLEAN IN/OUT clears Manual and restores the automatic map. RESET does the same and also turns Bypass off.

0% is clean in the automatic state after RESET or factory CLEAN IN/OUT. In Manual or a creative preset, 0% means the customised starting point. Loading a saved DAW project restores the actual saved master position and Manual state.

4. Signal Flow and Tone & Saturation

Processing path

```
Input -> latency-aligned dry branch
Tape: transport -> L/R Skew -> Head Bump -> Crosstalk
-> record dynamics / HF warmth -> Asperity -> Dropouts / Jam
-> HF Cut -> Saturation / Asymmetry -> level matching
-> Post Print -> Signal Noise + background generators
Dry / tape Mix -> Gain -> optional peak guard -> output meter
```

TapeEngine processes the programme once. It has no delay feedback loop. Post Print contributes one filtered delayed imprint, not a train of repeats. Tape noises enter the tape branch after its tone and damage processing, so HF Cut does not also filter the background Hiss generator.

The 26 ms transport delay and fixed dynamics lookahead are reported together: 32.154 ms at 44.1 kHz, 31.750 ms at 48 kHz, and 29.750 ms at 96 kHz. Dry, OFF and Bypass retain the same latency. Let the DAW compensate it. The reported tail is two seconds; background noise can continue while audio processing runs.

Saturation - OFF to 100%

Soft clipping adds harmonics and compression. The response depends on input level: a louder source reaches the nonlinear region more strongly. The displayed percentage controls a blend of drive and saturation strength, with internal level compensation; it is not THD or an input-gain reading.

Use a modest amount for density, or raise it for audible distortion. Compensation reduces the usefulness of judging this effect by volume alone. Compare attack shape and harmonic texture at similar listening levels.

Asymmetry - OFF to 100%

Offsets the nonlinear curve to create unequal treatment of positive and negative waveform halves and stronger even harmonics. The module can work independently of Saturation; together they shape the same nonlinear stage. DC generated by the asymmetrical change is removed.

Asymmetry does not calculate high-frequency AC bias current or reproduce an entire tape magnetisation/hysteresis system. Its name describes the implemented waveshaping behaviour.

HF Cut - OFF / 20 down to 5 kHz

A fourth-order Butterworth low-pass approximates reduced playback bandwidth. The slope is 24 dB per octave and the shown cutoff is the -3 dB point. The minimum-effect position bypasses the filter. Increasing the knob clockwise lowers the frequency and darkens the tape branch.

Head Bump - OFF to +5 dB

A broad low-frequency peak approximates playback-head coloration. As depth rises, its centre moves from about 115 Hz towards 74 Hz and the peak becomes slightly more focused. Strong settings can add substantial bass level; use output Gain and listen in context.

5. Tape Motion

All four movement controls change the timing of the tape branch and therefore its instantaneous pitch. Each operates independently.

Wow - OFF to 100%

Slow recurring speed variation produces rounded pitch wobble. The motion includes small random changes instead of being a perfectly stable sine wave. This suggests capstan, roller or reel-related irregularities.

Low settings add movement to sustained notes. Higher settings create pronounced warble. The percentage is the depth of this model, not the weighted wow-and-flutter percentage specified for a physical recorder.

Flutter - OFF to 100%

Faster transport variation produces rapid pitch fluctuation and a rougher edge on sustained material. It can be easier to hear on piano, organ, pure tones or sustained strings than on a busy transient-rich mix.

Flutter complements slow Wow. Increasing both creates complex movement, but the two knobs do not simply multiply each other.

Drift - OFF to 100%

Continuous, slow, irregular transport wandering creates pitch movement over several seconds. The internal motion changes pace and shape, rather than applying a fixed speed offset. Listen through a sustained phrase to hear the full trajectory.

The current model wanders at approximately 0.12-0.22 Hz and can reach about +/-20 ms of timing displacement at its own maximum. These are model parameters, not a measured speed-error specification for a recorder.

Chew - OFF to 100%

Local tape deformation and friction-like instability are approximated by short pitch bends with a faster vibration component. Chew differs from continuous Drift: its contour suggests individual damaged sections passing through the transport.

Chew is not gated by Drift and does not require Wow or Flutter. At high values it deliberately exaggerates tape damage for sound design.

Using motion together

Begin with one motion control and a stable pitched source. Add another only when the first behaviour is clear. A small Flutter layer can give a slow Drift setting a worn edge; a high Chew setting can create local bends over a steadier Wow cycle.

Mixing the time-varying tape branch with Dry can create phase interaction, comb filtering and chorus-like colour. This is expected when the two branches no longer contain the same waveform at the same instant.

The extreme end is intentional. 100% is a creative limit, not the operating specification of a healthy machine. For stable pitch, keep motion controls low even when using stronger Saturation or Asymmetry.

6. Stereo & Damage

L/R Skew - OFF to 250 microseconds

Delays the right channel relative to the left, creating interchannel phase and timing error. It models one stereo consequence of a skewed head. It does not model all treble loss or cancellation within an individual tape track. Check mono compatibility when using large values.

Crosstalk - OFF / -100 to -6 dB

Leaks a broadband portion of each channel into the other and normalises the sum. The displayed value describes the relative crossfeed coefficient before that normalisation. Higher settings reduce separation and make the stereo image more interconnected.

The effect is easiest to hear on a source with different left and right content. Perfectly identical channels change little. L/R Skew and Crosstalk require a stereo bus to provide their intended interchannel effects; on a mono bus those stereo operations are skipped.

Asperity - OFF to 100%

Fine random amplitude variations approximate the modulation texture associated with a rough magnetic surface. This effect multiplies existing tape audio rather than adding an independent background generator. It is therefore most apparent during the signal.

Dropouts - OFF to 100%

Short random level dips suggest damaged coating or brief interruptions in playback. Depth and event frequency rise together. Left and right dips are related but can differ in depth. The strongest quarter of the knob adds extra severity beyond the earlier part of its range.

Dropouts do not mute every downstream source: Post Print and the noise generators are added later in the chain. Consequently a noise bed or a ghost of earlier audio may remain audible while the current programme drops.

Jam/Sag - OFF to 100%

Intermittent slowing combines with level dips and temporary dulling to suggest sticking tape and poor transport contact. It is a combined mechanical-damage event, distinct from the shorter level-only Dropouts.

Event depth and frequency increase with the knob, with a stronger nonlinear region above 75%. Events are irregular, so allow enough playback time to judge a low setting.

Post Print - OFF to 100%

Adds one quieter, filtered copy of earlier programme audio after 1.6 seconds. It approximates magnetic transfer between adjacent layers of wound tape. The stored imprint contains programme audio before the background noise generators and is not fed back.

Real layer spacing, tape speed, winding geometry, storage and temperature influence print-through. The fixed 1.6-second spacing is a deliberate model choice, not a universal physical constant. The imprint is spectrally limited rather than a full-band duplicate. This implementation produces post-echo only; it cannot predict future audio to create pre-echo.

Stereo & Damage contains related creative approximations, not a complete mechanical simulation. These descriptions distinguish channel skew, surface modulation, coating loss, sticking and layer transfer so that their roles remain clear.

7. Noise & Texture

The dB values below control the gains of differently shaped generators. They are not calibrated dBFS noise measurements or tape SNR specifications. Perceived level depends on spectrum, bandwidth, source level, Mix, Tape Dynamics and output Gain.

Control	Minimum / maximum	Behaviour in a pause
Signal Noise	OFF (-120) / -36 dB	No new noise when aligned input is zero
Hiss	OFF (-80) / -48 dB	Continuous background
Rumble	OFF (-80) / -42 dB	Continuous low-frequency background
Hum	OFF (-80) / -12 dB	Continuous electrical tone
Buzz	OFF (-80) / -42 dB	Continuous harmonic interference
Crackle	OFF (-80) / -32 dB	Intermittent bursts can occur

Signal Noise

Independent pink-noise grains multiply each channel's latency-aligned input samples. Louder input creates more noise; smaller samples create less. There is no envelope detector with an attack, release or held noise tail. Digital zero in a channel produces no new Signal Noise in that channel.

This is a signal-proportional modulation-noise approximation. A recording containing room tone or residual background audio is not digital silence, so it can still generate a small amount. It also uses the aligned input reference rather than following every later transport dropout.

Hiss

A mostly white, partly pink broadband bed approximates steady tape/electronics noise. It remains during pauses. The automatic master curve keeps it restrained early on, reaches -70 dB at 60% and reaches its -48 dB knob maximum at 100%.

Rumble

Low-frequency noise suggests mechanical vibration picked up in a recorder's electrical path. This generator can increase bass energy even when the input is quiet. It is not a pitch-modulation control.

Hum

Predominantly sinusoidal 50 Hz pickup with a small 100 Hz component suggests mains-related electrical interference. It adds a stable low tone and can create a sense of bass presence. Its -12 dB maximum is deliberately strong; it is not an acceptable hum specification for a healthy recorder.

Buzz

A harmonic-rich 100 Hz pulse train, band-limited to approximately 2.4 kHz, suggests power-supply interference. It sounds sharper than Hum because it contains many upper harmonics. Hum and Buzz share a mains relationship but are separate generators.

Crackle

Sparse short noise bursts suggest intermittent electrical contacts or static. The control sets burst strength, with limited rate variation. Unlike a continuous noise floor, the audible result depends on whether an event occurs during the passage you hear.

8. Mix, Gain, Bypass and Metering

Tape Dynamics - default ON

Combines soft-knee record compression, fast dynamic HF warmth, programme-level matching and a final -0.2 dBTP ceiling. Colour follows actual Saturation/Asymmetry settings, including 0% + manual presets. This is a recorder-inspired hybrid, not an exact model of one machine.

Level matching compares programme before added noise and Post Print, within +/-18 dB. It responds quickly to starting or changing controls, then tracks more slowly. Silence and intentional Dropouts/Jam hold compensation. It does not remove added Hum, restore cut frequencies or raise quiet recordings to the ceiling.

The stereo-linked peak guard acts after Mix, Gain and all noise, only while this button is ON and Bypass is OFF. It uses lookahead, reconstruction filtering near Nyquist and an internal safety margin. At 48 kHz its extra delay is 5.750 ms. OFF restores the previous processing path with the same total delay.

Mix - OFF to 100%

With Dynamics OFF, the original parallel law applies:

Mix	Dry gain	Tape gain
OFF (0%)	1.0	0.0
25%	1.0	0.5
50%	1.0	1.0
75%	0.5	1.0
100%	0.0	1.0

Identical branches at 50% sum to approximately +6 dB. Dynamics ON divides both gains by their sum to compensate this rise. Motion can still cause phase interaction.

Gain and Bypass

Gain (-12 to +12 dB) follows matching and Mix; it does not drive Saturation harder. The active peak guard follows Gain. Bypass returns aligned dry input and overrides every process, including the ceiling. The DAW names this button A/B Compare.

Stereo output meter

Shows output sample peaks and RMS, including Gain and the peak guard. It is not a tape VU or true-peak meter. When Dynamics is OFF or Bypass is ON, there is no output ceiling. The plug-in cannot constrain gain or processing added after it in the DAW.

9. Presets and Project Recall

Select a sound

Click the preset name for the menu, or use the arrows. The library contains CLEAN IN/OUT and sixteen creative factory presets, plus user entries. An asterisk marks changes to preset settings; adjusting Gain does not mark the preset as edited.

Creative and user presets retain their sound at Tape Character 0% with + manual active. Their settings become the starting point for master movement; returning to zero restores that sound. Factory CLEAN IN/OUT restores the automatic map without Manual. RESET also restores that map.

Save, rename and delete

1. Adjust the sound, then click the floppy-disk Save button in the header.
2. Enter a meaningful name and confirm. The bank stores twenty tape controls, Tape Character, Mix, Tape Dynamics and the Manual relationship. Gain is not stored.
3. Use the rename icon beside a user entry to edit its name. Use its delete icon and the confirmation window to remove it.
4. Keep factory entries as references; normal user controls do not rename or delete them.

Saving rebases the master to 0% without changing the module values. Preset recall preserves the current Gain and Bypass, including factory CLEAN IN/OUT. Old preset Gain fields are ignored; RESET still returns Gain to 0 dB.

Where presets are stored

```
%APPDATA%\PhotonDSP\TapeEngine\Presets\PresetsTable.txt
```

This is the current Windows user's shared TapeEngine library, used by VST3. To back it up, close TapeEngine instances and copy the file to a safe location. Restore backups with instances closed, then reopen the plug-in.

The preset menu and each save, rename or delete operation refresh the shared bank. Changes from other instances are retained. If the bank is busy, retry the operation. If an entry was changed or removed elsewhere, reopen the preset menu before editing it again.

DAW project state

The DAW stores the actual plug-in state: parameter values, current Tape Character position, Manual corrections and preset identity. Reopening a project does not act like selecting a new preset and does not force the master to zero. The audible settings do not depend on finding that preset name in the external library.

Automation

All twenty tape modules and the five master/output controls are available to host automation. Only active controls are enumerated in TapeEngine 1.1; inactive donor-delay slots remain reserved internally for old state data.

Automating a tape knob is an individual edit and can establish a Manual correction. Master automation continues to use it. Use RESET or factory CLEAN IN/OUT before recording a purely automatic Tape Character sweep, and avoid conflicting knob automation.

10. Factory Preset Guide

Factory sounds explore combinations that the automatic condition scale does not describe. They are creative starting points, not claims to reproduce particular recorders. Adjust input level and output Gain for your material.

Preset	Character and a useful listening focus
CLEAN IN/OUT	Minimum tape processing, Mix 100% and Tape Dynamics on. Clears Manual; preserves Gain and Bypass.
Bad Tape Good Deck	Damaged medium with a comparatively steady transport. Listen for surface texture, interruptions and loss of clarity.
Good Tape Bad Deck	Cleaner medium through an unstable mechanism. Listen to sustained pitch and channel behaviour.
Capstan Fever	Pronounced transport movement. A useful starting point for unstable sustained instruments.
Slow Reel Wander	Slow wandering pitch and aged reel character. Let a long phrase play before judging the motion.
Wrinkled Tape	Local bends and irregular deformation. Designed for a more damaged medium.
Missing Oxide	Coating-loss interruptions and roughness. Try it on loops with space between events.
Sticky Splice	Sticking, sag and intermittent transport trouble. Listen to both pitch and momentary dulling.
Hot Tape Drive	Strong tape coloration and nonlinear density. A creative drive preset, not a mastering recommendation.
Crossed Tracks	Interchannel leakage and skew. Most evident on a source with different left and right information.
Ghost Reel	Earlier programme leaves a filtered delayed imprint. Use separated phrases to reveal the ghost.
Tired Portable	Combined bandwidth, movement and noise suggest a compromised portable recorder.
Noise Orchestra	A deliberately strong blend of background generators, including Hum at its maximum. Reduce monitoring level before comparison.
Signal Sandpaper	Signal-following grain and roughness; independent background generators are off.
Mains Resonance	Bass coloration and electrical interference from Head Bump, Hum, Buzz and Rumble.
Ghosts In The Gaps	Deep programme dropouts contrast with a strong Post Print of earlier material.
Asymmetric Burn	Asymmetrical saturation without transport movement or background noise.

Creative and user presets start at 0% + manual. Turning the master right adds severity from their existing balance instead of replacing it with an automatic archetype. Factory CLEAN IN/OUT is the exception: it restores the clean automatic map.

11. Practical Use and Troubleshooting

Add colour without a noise bed

Start with RESET. Set Saturation and Asymmetry individually, add modest Head Bump if useful, and leave the six noise controls at OFF. Tape character does not require audible background noise. Add HF Cut only when you want less high-frequency content.

Make a worn or broken texture

Choose which physical symptom should lead: sustained Wow/Drift, local Chew, coating-like Dropouts, or sticking Jam/Sag. Add the other symptoms gradually. Check the result in mono when using L/R Skew or Crosstalk.

Noise continues after the source stops

Hiss, Rumble, Hum, Buzz and Crackle are independent backgrounds and can continue in pauses. Signal Noise adds nothing when its aligned input is exactly zero; residual source audio still counts as a signal. Post Print can replay an earlier phrase 1.6 seconds later. A host may suspend processing on silence, which changes whether continuous noise is heard.

The master is at zero but the effect remains

A creative preset or manual starting value can sound at 0%. Look for + manual. Press RESET or select factory CLEAN IN/OUT to clear individual corrections and restore the clean automatic map.

Movement is difficult to hear

Use a sustained pitched source, Mix 100% and one movement control at a time. Drift unfolds over seconds. Transient-heavy audio can hide subtle motion, while two different channels can make stereo changes easier to identify.

The sound becomes much louder

Tape Dynamics is ON by default and compensates programme-level changes while limiting the final output to -0.2 dBTP. OFF and Bypass remove the ceiling. Check these buttons, Gain, Head Bump and the sum of noise generators when comparing levels. Source level also changes the strength of saturation.

The plug-in does not appear, or an old version loads

Confirm that the complete x64 VST3 bundle is in a scanned VST3 folder. Remove duplicate older copies from other scanned locations, then rescan or restart the DAW. Check About for version 1.1. Keep a backup before replacing a version used by important projects.

Audio breaks up or a live input feels late

Increase the host or audio-driver buffer if the session cannot run reliably. TapeEngine reports 31.750 ms total latency at 48 kHz, including dynamics lookahead, even when Dynamics is OFF or Bypass is ON. Host compensation aligns playback; live monitoring still incurs this delay.

Help, licence and support

The full version is permanently free and requires no activation or periodic internet check. Read the accompanying EULA for permitted use and applicable terms. For product support, use the support channel at photondsp.com and include TapeEngine version, host, Windows version, sample rate, buffer size and reproduction steps.

[PhotonDSP support](#)