MSS Media Lab 2.0

User Manual

Video Restoration Suite · Version 2.0.0

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1. Introduction

MSS Media Lab 2.0 is a Windows application for restoring scanned film and legacy video. It is built for the material a film-transfer shop or archive actually handles: 8mm, Super 8, 16mm and 35mm film scans, videotape transfers, and old digital captures that arrive faded, scratched, dusty, shaky, flickering or interlaced.

The program works as a **restoration pipeline**: you load a source file, switch on the restoration tools the material needs, preview the result, and render a finished file (or image sequence) through a processing queue. Its strongest tools — **Scratch Removal** and **Dust & Dirt Removal** — analyze the picture *across time*, comparing each frame with its neighbours so that damage can be repaired while real picture detail is preserved.

What MSS Media Lab is designed for:

- Repairing film damage: vertical scratches, dust, dirt, dropouts, flicker and fading.
- Correcting color, contrast and white balance on aged material.
- Deinterlacing and stabilizing legacy video and telecine transfers.
- Enlarging footage with AI upscaling and smoothing motion with AI frame interpolation.
- Producing archival masters (lossless FFV1, ProRes, TIFF/PNG sequences) and delivery copies (H.264, H.265, AV1).
- Estimating restoration work for customers with **Smart Analyze** and printable estimate PDFs.

What it is **not**: MSS Media Lab is not a video editor. There is no timeline, no cutting, no titling and no audio mixing. The intended workflow is to restore complete reels or clips here, then take the restored master into an editor (Premiere, Resolve, Final Cut) if editing is needed. Audio is passed through untouched from the source file (see Section 16).

> **Tip:** If you only remember one thing from this manual, make it this: **always run a Render Preview on a representative section before starting a long render.** Section 7 explains why.

2. System Requirements

2.1 Minimum and recommended

Component	Minimum	Recommended
Operating system	Windows 10, 64-bit	Windows 10 or 11, 64-bit
CPU	Modern multi-core x64 processor	8+ cores — Scratch Removal and Dust & Dirt Removal are heavily multi-threaded
RAM	16 GB (HD and ~2.5K material, at reduced parallelism)	32 GB for high-resolution restoration; 64 GB for full parallelism on large scans
GPU	None required for CPU-only work	NVIDIA GPU with a current driver — required for GPU encoding and the AI tools
GPU memory (VRAM)	—	2 GB+ for AI Upscale (Real-ESRGAN); more VRAM enables higher performance profiles; the optional SeedVR2 engine needs ~24 GB
Storage	~7 GB for the installation	Fast NVMe SSD for the output/working drive, plus generous free space (see below)

Notes:

- The required CUDA runtime libraries are bundled with the application; you do not install CUDA separately. You do need a current NVIDIA driver for GPU features.
- On systems without an NVIDIA GPU, the program still runs: GPU encoders automatically fall back to their CPU equivalents, and AI tools that require an NVIDIA GPU are flagged in **System Check** (Section 5.6).
- Very large frame sizes are protected rather than crashed: on machines without enough memory for them, memory-intensive stages such as Scratch Removal on ~4K scans are refused with a clear message instead of failing mid-render.

2.2 Why working space matters

During a render, MSS Media Lab writes **temporary working files next to your output file** (Section 18). For restoration work these intermediates are kept at very high quality, so they are large — for a long, high-resolution reel the temporary space can run to hundreds of gigabytes. The built-in **storage preflight** (Section 19) estimates the requirement for every job before anything starts, so you are never surprised mid-render, but you should still plan output drives with plenty of free space. An NVMe SSD on

the output drive also speeds up every stage that reads and writes those intermediates.

2.3 Processing time

Processing time is deliberately not promised in this manual, because it varies enormously with:

- source **resolution** and **duration**;
- **which tools** are enabled — Scratch Removal and Dust & Dirt Removal analyze every frame against its neighbours and take far longer than simple filters;
- **defect density** — heavily damaged film gives the detectors more candidates to examine;
- **hardware** — CPU core count, RAM, GPU and especially storage speed;
- the **encoding choice** — lossless and AV1 encodes are much slower than GPU H.264.

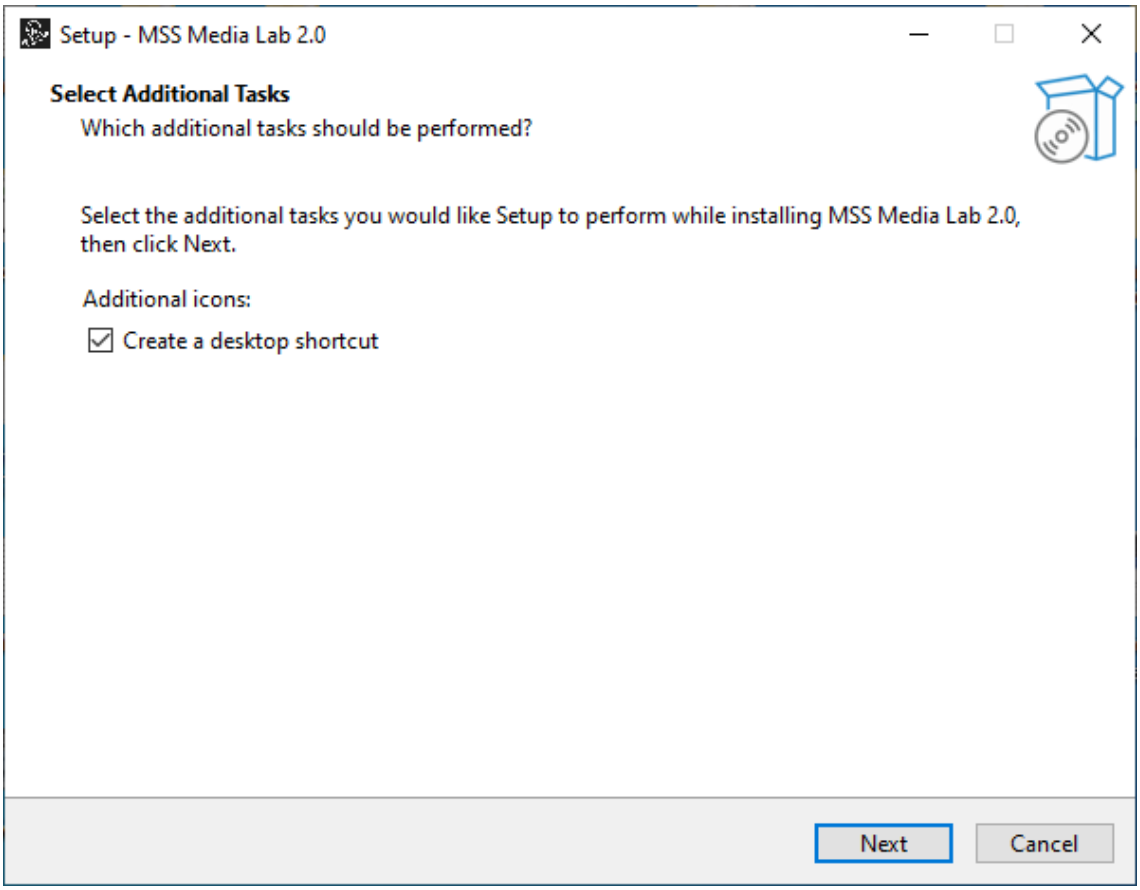
A long reel through the full restoration chain is routinely an overnight job. This is normal, and it is exactly why previewing first matters.

3. Installation

3.1 Installing

1. Run **MSSMediaLab_2.0.0_Setup.exe**.
2. Windows asks for administrator approval (a **User Account Control** prompt). Approve it — administrator rights are needed only to install and uninstall; the application itself always runs as a normal user.
3. Follow the wizard. The default installation folder is `C:\Program Files\MSS Media Lab 2.0`.
4. Optionally tick **Create a desktop shortcut**.
5. On the last page, leave **Launch MSS Media Lab 2.0** ticked to start the program immediately.

The installer creates a Start Menu group **MSS Media Lab 2.0** containing the application shortcut and **Uninstall MSS Media Lab 2.0**.



The Setup wizard

3.2 First launch

On first launch you will see the MSS Media Lab splash screen, then either the activation window (Section 4) or, once activated, the main window. The first launch can take noticeably longer than later ones while Windows caches the application files.

3.3 Coexistence with MSS Media Lab 1.0

MSS Media Lab 2.0 installs **alongside** version 1.0 — it never modifies or removes a 1.0 installation. The two versions have distinct Start Menu entries ("MSS Media Lab" for 1.0, "MSS Media Lab 2.0" for 2.0) and separate entries in Windows **Apps & Features**. You can keep 1.0 installed during a transition period and uninstall it whenever you are ready.

3.4 Uninstalling

Uninstall from Windows **Settings** → **Apps** → **MSS Media Lab 2.0**, or with the **Uninstall MSS Media Lab 2.0** Start Menu shortcut. Uninstalling removes the program folder and shortcuts, and **keeps**:

- your restored output files;
- your settings, license activation, business settings and presets;
- your job history;
- MSS Media Lab 1.0, if installed.

Reinstalling (or upgrading in place by running the installer again) preserves the same user data.

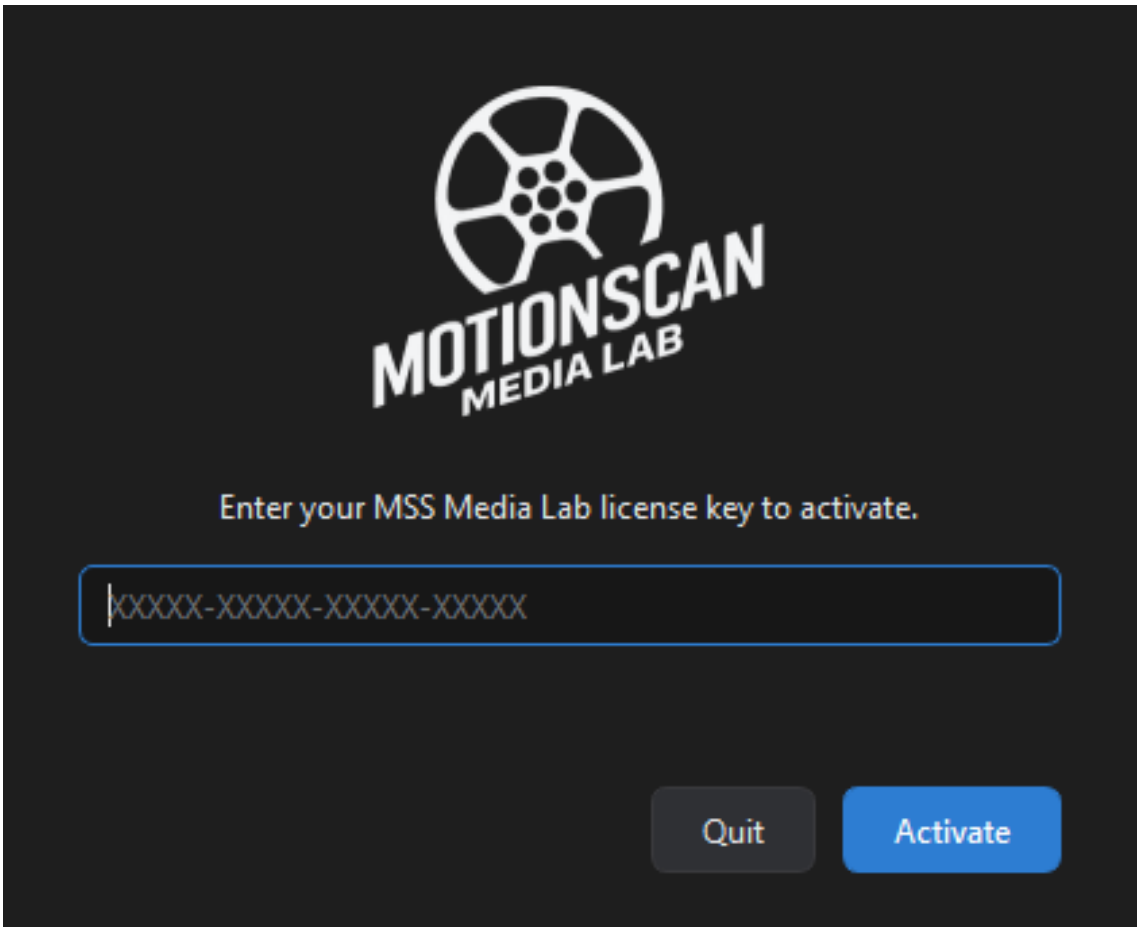
4. Licensing and Activation

4.1 Activating

The first time MSS Media Lab 2.0 starts, the **Activate MSS Media Lab** window appears:

1. Enter your license key in the field (format: XXXXX-XXXXX-XXXXX-XXXXX).
2. Click **Activate**. Activation needs an internet connection; the status line shows "Activating..." and then the result.
3. On success the main window opens.

Clicking **Quit** closes the program without activating.



The activation window

4.2 Invalid keys and persistence

- An invalid, mistyped or already-used-up key is rejected with a message in the activation window; the window stays open so you can correct the entry. The main window never opens without a valid activation.
- A successful activation is stored on the computer. After a restart, the program verifies the license in the background and opens straight to the main window — you do not re-enter the key.
- The stored license is checked online at startup. If your computer is temporarily offline, a previously activated program still starts; validation resumes when a connection is available.

4.3 Trial licenses

If your key is a trial key, the program shows a dismissible banner in the main window when the trial is close to its end ("Your MSS Media Lab trial expires in N days"), with a **Purchase Now** button that opens the Motion Scan Systems website. When a trial has ended, the **Trial Expired** window appears at startup with three choices: **Purchase License** (opens the website), **Enter License Key** (activate a full or new key), or **Quit**.

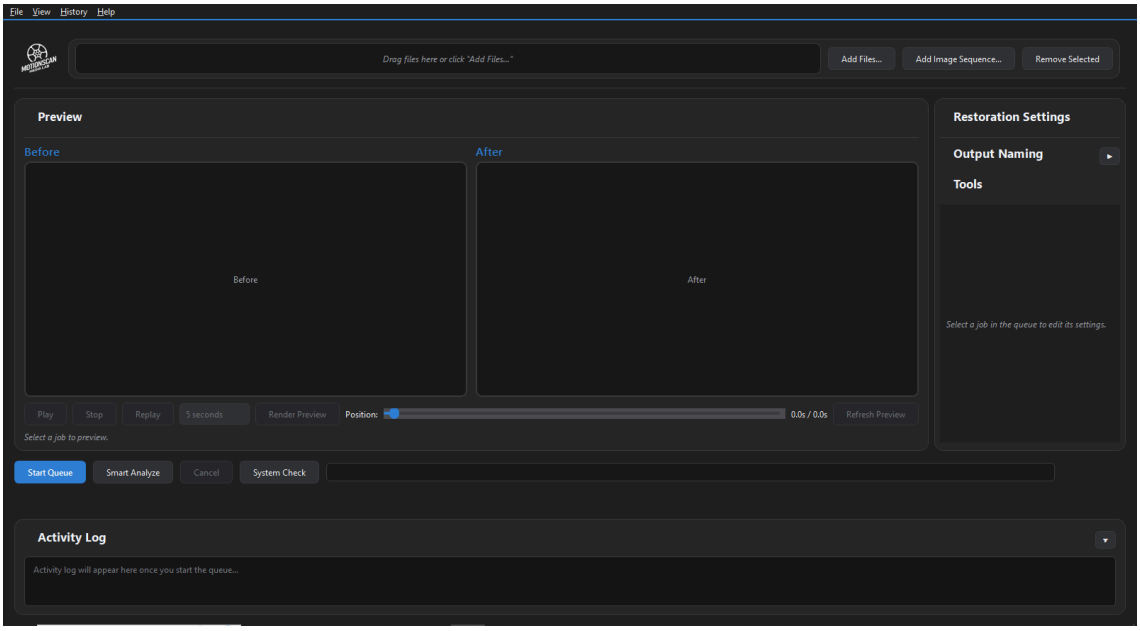
4.4 Moving a license to another computer

Use **Help** → **Deactivate License...** on the old computer. After confirming, the activation is released and the program returns to the activation window; you can then activate the same key on another machine.

4.5 If activation fails

1. Check the key for typing mistakes — all four groups, including the dashes.
2. Confirm the computer is online and that a firewall is not blocking the application.
3. If the key is reported as already in use, deactivate it on the previous computer (Section 4.4) and try again.
4. If it still fails, contact Motion Scan Systems through **www.motionscansystems.com/mss-media-lab** with the exact message shown in the activation window.

5. Main Interface Tour

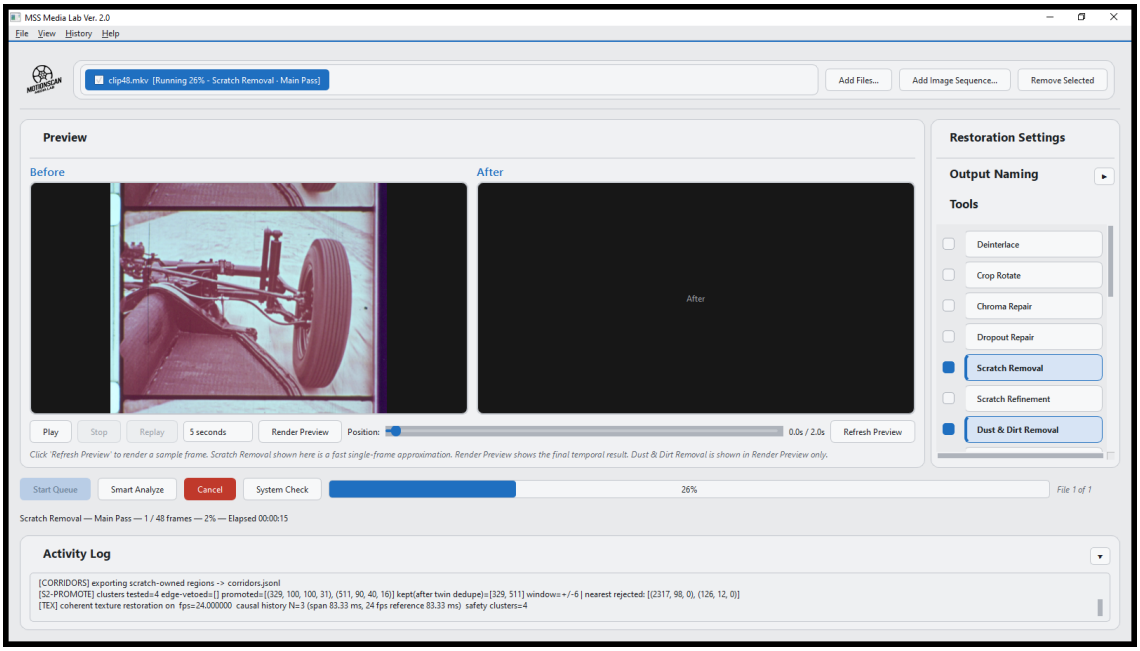


The main window

The main window has six areas, top to bottom:

5.1 Menu bar

- **File** — **Save Project**, **Save Project As...**, **Open Project...** (a project file, `.msslabproj`, stores your queue and every job's settings so a session can be reopened later), and **Business Settings...** (Section 23.3).
- **View** → **Theme** — **Dark**, **Slate** or **Light**. The choice is remembered.
- **History** — **View Job History...** (Section 23).



The Light theme, mid-render

- **Help** — **About MSS Media Lab** (shows *Version 2.0.0*), **Credits & Licenses...**, and **Deactivate License...** (Section 4.4).

5.2 Source strip (queue)

The horizontal strip under the logo is the **job queue**: one chip per loaded file, showing its name and status (*Pending*, *Running* with a percentage and the active stage, *Done*, *Cancelled*, *Failed*).

- **Drag files onto the strip** or click **Add Files...** to load video files.
- **Add Image Sequence...** imports a folder of numbered frames (Section 6.2).
- **Remove Selected** removes the selected job from the queue.
- The checkbox on each chip enables/disables that job for the next queue run.
- **Right-click a finished (Done) job** for **Re-render...** and **Export Comparison...** (Section 7.6).

Click a job to select it — the Preview panel and the Tools panel always show the selected job.

5.3 Preview panel

The large left panel, with **Before** and **After** panes, playback buttons (**Play**, **Stop**, **Replay**), the Render Preview length selector and **Render Preview** button, the **Position** slider, and **Refresh Preview**. Section 7 covers it in depth.

5.4 Restoration Settings panel (Tools)

The right panel. **Output Naming** (collapsed by default — click **»**) holds the output folder and the filename template (Section 18.2). Below it, **Tools** lists every restoration tool in processing order, each with an enable checkbox and a button that opens that tool's full-screen settings dialog with its own Before/After preview.

5.5 Run controls and progress

- **Start Queue** — checks outputs and storage, then runs every enabled Pending job in order.

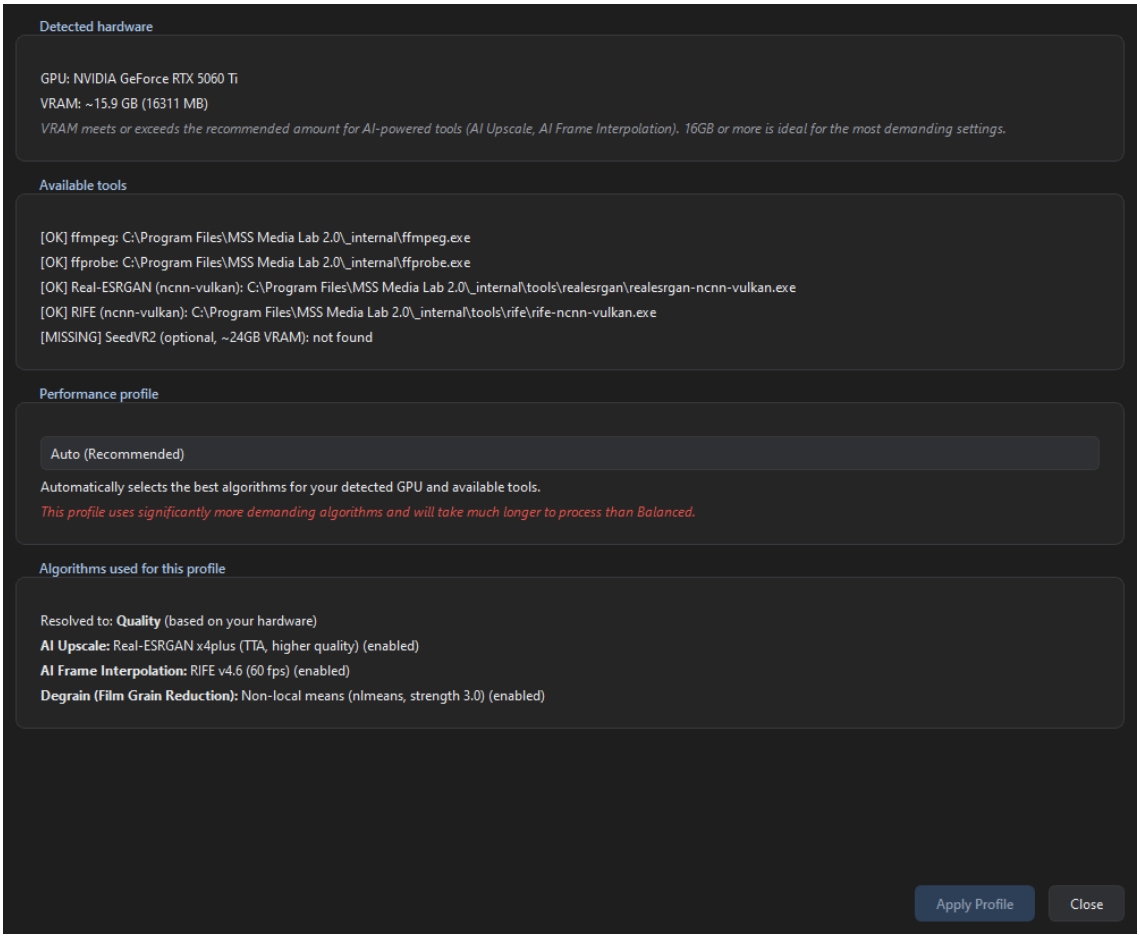
- **Smart Analyze** — analyzes the selected source and recommends tools (Section 23.2).
- **Cancel** — cancels the running queue (Section 22.1).
- **System Check** — hardware and tool status (Section 5.6).
- The **progress bar** shows the whole job ("Ready" when idle); the label to its right shows "File N of M".
- Under the run controls, a **stage status line** shows live progress inside the active stage — for example `Scratch Removal — Main Pass — 1,240 / 27,473 frames — 4% — Elapsed 00:12:40` (Section 21).

5.6 System Check & Performance Profile

Click **System Check** to open a dialog showing:

- the detected **GPU** and approximate **VRAM**;
- availability of each bundled tool (FFmpeg and the AI engines);
- the **performance profile**: **Auto (Recommended)**, **Balanced**, **Quality**, **Maximum (Professional)** or **Minimal (CPU-only)**. Auto resolves to the best profile your hardware supports and shows which algorithm each stage will use. The Maximum profile's full quality additionally requires the optional SeedVR2 engine (Section 15.8).

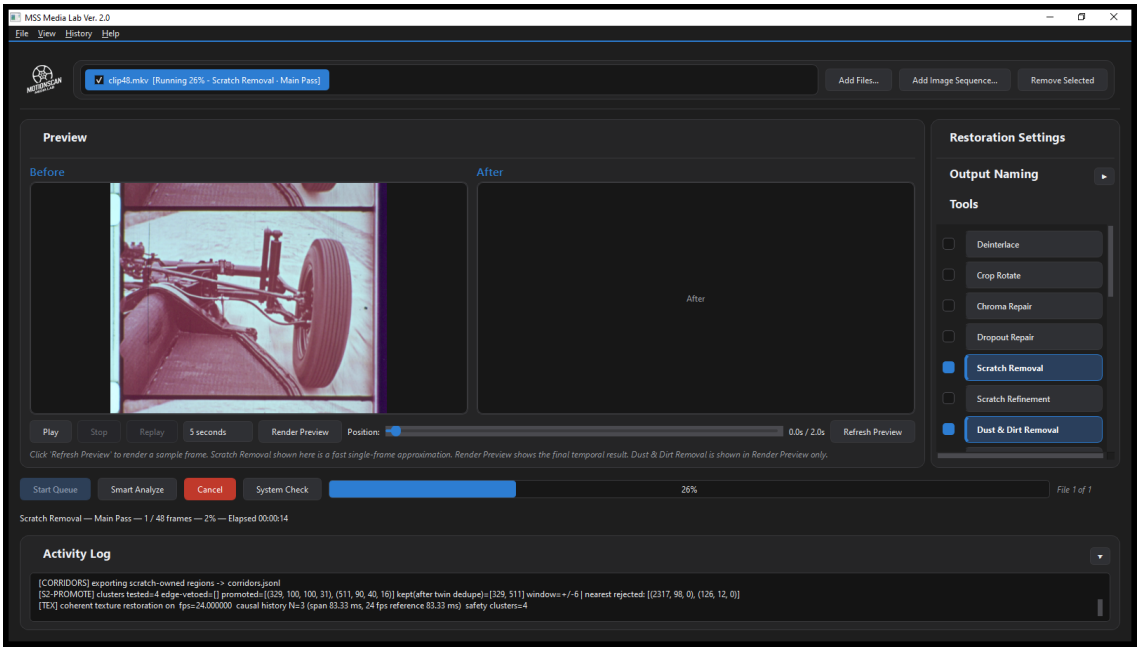
A warning appears here if an AMD GPU is detected, because the AI tools (AI Upscale, AI Frame Interpolation) require an NVIDIA GPU and will otherwise run on CPU paths.



System Check & Performance Profile

5.7 Activity Log

The bottom panel. While a queue runs it receives the engine's progress lines, the storage check's per-drive results, and tool summaries such as `Dust & Dirt Removal: 112 specks repaired · uncertain areas left unchanged`. Harmless decoder notices are filtered out so the log stays readable.



A job running: queue chip, stage status line, progress bar and Activity Log

6. Opening and Loading Media

6.1 Video files

Load video with **Add Files...**, or drag files from Explorer onto the queue strip. Supported containers: **MP4, MOV, AVI, MKV, MTS, M2TS, WMV, VOB, MPG, MPEG**. Each file becomes one job with its own independent settings.

When a file is loaded, MSS Media Lab probes it (resolution, frame rate, duration, codec, interlacing) and shows the first frame in the Preview panel. Before restoring, check:

- **Duration** — the Position readout shows `current / total` seconds. Confirm the whole reel is there.
- **Picture** — scrub the **Position** slider across the clip. Is it interlaced (comb lines on motion — Section 9)? Faded? Scratched? What you see here decides which tools to enable.
- **Interlaced sources** — the program detects interlacing automatically; note that **Dust & Dirt Removal is not yet available for interlaced footage** until **Deinterlace** is enabled for the job (the tool row says so).

6.2 Image sequences

Add Image Sequence... imports a folder of numbered frames (`.tif/.tiff/.png/.jpg/.jpeg`) — typical scanner output. Pick any frame in the folder; the **Import Image Sequence** dialog shows how many frames were found, warns about numbering gaps, and asks for the **frame rate** the frames should play at (for 16mm film, commonly 16–24 fps; enter the rate your scan was made for). Click **Import** to add the sequence to the queue as a job.

> **Note:** The frame rate you enter here defines the clip's timing for everything downstream — previews, FPS Correction and the output file.

6.3 Projects

File → Save Project stores the entire queue — every file and every tool setting — in a `.msslabproj` file. **Open Project...** restores it, re-checking that the source files still exist. The title bar shows the project name and marks unsaved changes; closing with unsaved changes asks **Save / Don't Save / Cancel**.

7. Preview vs Render Preview

This section is the heart of the recommended workflow. MSS Media Lab has **two kinds of preview**, and they answer different questions.

7.1 Preview (the Before/After panes)

The **Before** and **After** panes show a **single frame** at the current **Position**: Before is the source frame, After is that frame run through the enabled tools. Click **Refresh Preview** (or move the Position slider) to update it. This is fast, and it is the right way to dial in *frame-based* tools: color, levels, sharpening, crop, deinterlacing.

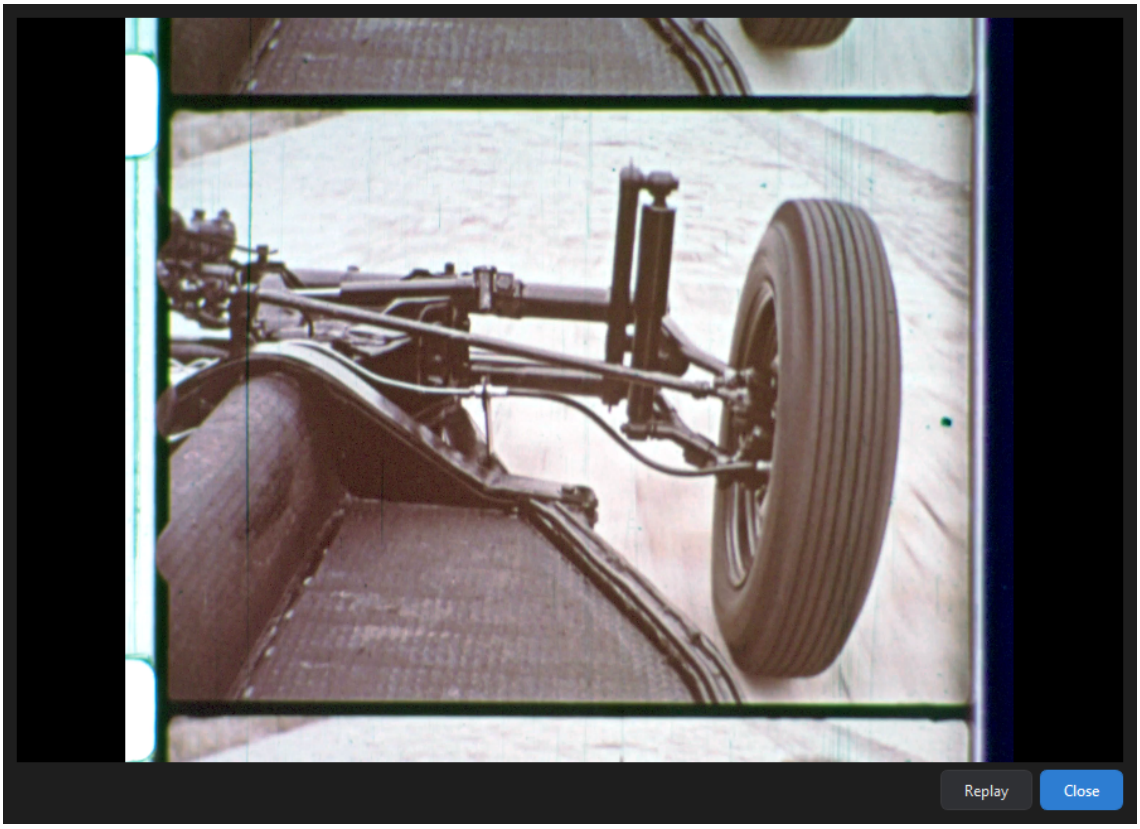
Its limits are stated right under the panes, and they matter:

- "*Scratch Removal shown here is a fast single-frame approximation. Render Preview shows the final temporal result.*" — real Scratch Removal studies many frames over time; a single frame can only approximate it.
- "*Scratch Refinement is shown in Render Preview only.*"
- "*Dust & Dirt Removal is shown in Render Preview only.*" — dust detection fundamentally requires neighbouring frames.

So the static preview is **not pixel-identical to the final render** for the temporal tools, and does not show Dust & Dirt at all. Do not judge Scratch or Dust settings from it.

7.2 Render Preview (the real pipeline, on a short section)

Render Preview renders a short section of the clip — **5, 10, 30 or 60 seconds**, chosen in the dropdown next to the button — **through the actual restoration pipeline**, exactly as a full render would run it: real temporal Scratch Removal, Scratch Refinement, Dust & Dirt Removal, every enabled tool, in order. While it runs, the status line shows each stage and an elapsed counter; when it finishes, a **Render Preview** window opens and plays the restored section (**Replay** / **Close**).



The Render Preview window playing a restored section

After a Render Preview completes, the After pane is upgraded: "*After shows the exact Render Preview result at this position, including Scratch Removal, Dust & Dirt and every other enabled tool.*" Scrub within the previewed section to inspect the true result frame by frame, and use **Play / Replay** to watch Before and After as moving video — many defects (and over-corrections) are only visible in motion.

Render Preview writes its temporary files to the same working area a real render uses (a `.mss_work` folder beside your output location — Section 18.3) and cleans them up automatically. Expect it to take time in proportion to the tools enabled: a 5-second Render Preview with Scratch + Dust on a 2.5K scan is minutes, not seconds. That is still vastly cheaper than discovering a problem six hours into a full render.

7.3 The representative-section method

Different films — even different reels of the same film — have different grain, damage, exposure and motion. A setting that is perfect for one reel can be too aggressive for the next. **Never assume; always test:**

1. Load the source and scrub through it.
2. Find a **representative section**: one that contains the defects you want repaired (the scratch, the dirty stretch, the flicker) *and* some normal, detailed picture.
3. Set the Position there and run a **Render Preview** (5 or 10 seconds is usually enough).
4. Inspect carefully: are the defects repaired? Is real detail — film grain, fine texture, deliberate vertical lines — untouched?
5. Adjust the tool settings.

6. **Render Preview again.**
7. If the clip's condition varies, repeat at a second, different-looking section.
8. Only when you are satisfied, start the full render.

> **Warning:** Stronger settings are not automatically better. Restoration tools make trade-offs: the harder they are pushed, the more likely they touch real picture content. Preview both damaged areas **and** clean, detailed areas before committing.

7.4 Playback controls

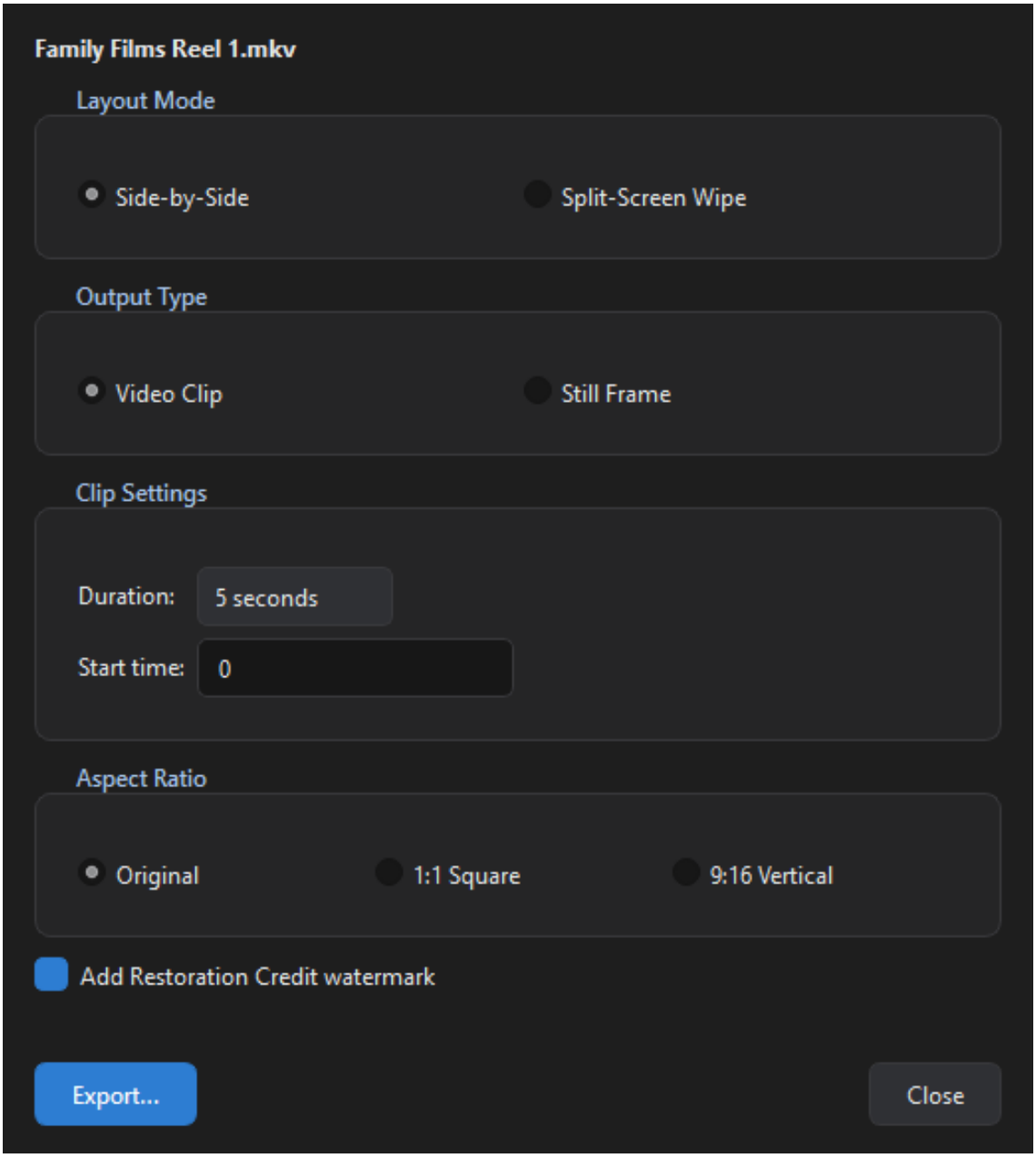
Play / **Stop** / **Replay** control playback in the preview panes; after a Render Preview has completed, they play the rendered Before/After clips, which is the best way to compare settings in motion. **Replay** restarts the last rendered preview from the beginning without re-rendering.

7.5 Prepare Scratch Refinement Data

When **Scratch Refinement** is enabled, a **Prepare Scratch Refinement Data** button appears under the preview. It pre-computes, in the background, the data the Scratch Refinement dialog needs for the 5-second window around the current playhead, so the dialog opens with its preview ready instead of computing it while you wait. Use it just before opening the dialog on the section you plan to inspect.

7.6 Export Comparison

Right-click a **Done** job and choose **Export Comparison…** to render a customer-facing before/after video of a chosen section: **Side-by-Side** or **Split-Screen Wipe** (the restored picture wipes across the frame), as a **Video Clip** or a single **Still Frame**, with a selectable duration and start time, square/vertical aspect-ratio options for social media, and an optional restoration-credit watermark. Ideal for showing a customer what the restoration achieved.



The Export Comparison dialog

8. Recommended Restoration Workflow

The tools run in a fixed, sensible order (the order of the Tools list). Your workflow follows it:

1. **Load the source** (Section 6) and select it in the queue.
2. **Inspect it**: scrub end to end. Note interlacing, damage types, fade, shake.
3. **Smart Analyze** (optional but recommended for unfamiliar material): it grades the condition and suggests tools (Section 23.2).
4. **Structural corrections first**: enable **Deinterlace** if the source is interlaced (Section 9); **Crop Rotate** to straighten and remove scanner borders; **Sprocket-Hole Stabilization** for film scanned with visible perforations (Section 15.6).
5. **Damage repair**: **Scratch Removal** (Section 12), then **Dust & Dirt Removal** (Section 13); **Dropo ut Repair** for tape dropouts; **Denoise/Degrain/Deflicker** as needed.
6. **Color**: **Fade Restore** (Section 10), then **White Balance / Color Restore / Color Grading** (Section 11).
7. **Finish**: **Sharpening**, **Stabilize**, optionally **Add Grain** or a **Watermark**.
8. **Refresh Preview** while adjusting each frame-based tool; use each tool's own dialog for its dedicated Before/After view.
9. **Render Preview** on representative sections — adjust — Render Preview again (Section 7.3).
10. **Choose output settings** (Section 16) and the output folder (Section 18).
11. **Start Queue.** Resolve any output-name conflict (Replace / Save as new version) and read the storage preflight result (Section 19).
12. **Monitor progress** (Section 21) — then inspect the finished output end to end before delivering it.

> **Tip:** Enable only the tools the material needs. Every enabled tool costs render time, and unnecessary processing is never free in quality terms.

9. Deinterlace

Interlaced video stores each frame as two half-pictures (fields) captured at different moments. On modern progressive displays this shows as **combing** — horizontal "teeth" on anything that moves. Interlacing is standard on VHS and other videotape transfers, DV, and broadcast-era captures.

When to enable Deinterlace:

- The source shows combing on motion when you scrub through it.
- The source is a videotape transfer (VHS, Video8, DV…) or a broadcast capture.
- Film that only survives as a videotape transfer: the *film* was progressive, but the *tape* is interlaced — deinterlace it.

When NOT to enable it: on progressive material (most file-based digital video and proper film scans). Deinterlacing progressive footage can only soften it.

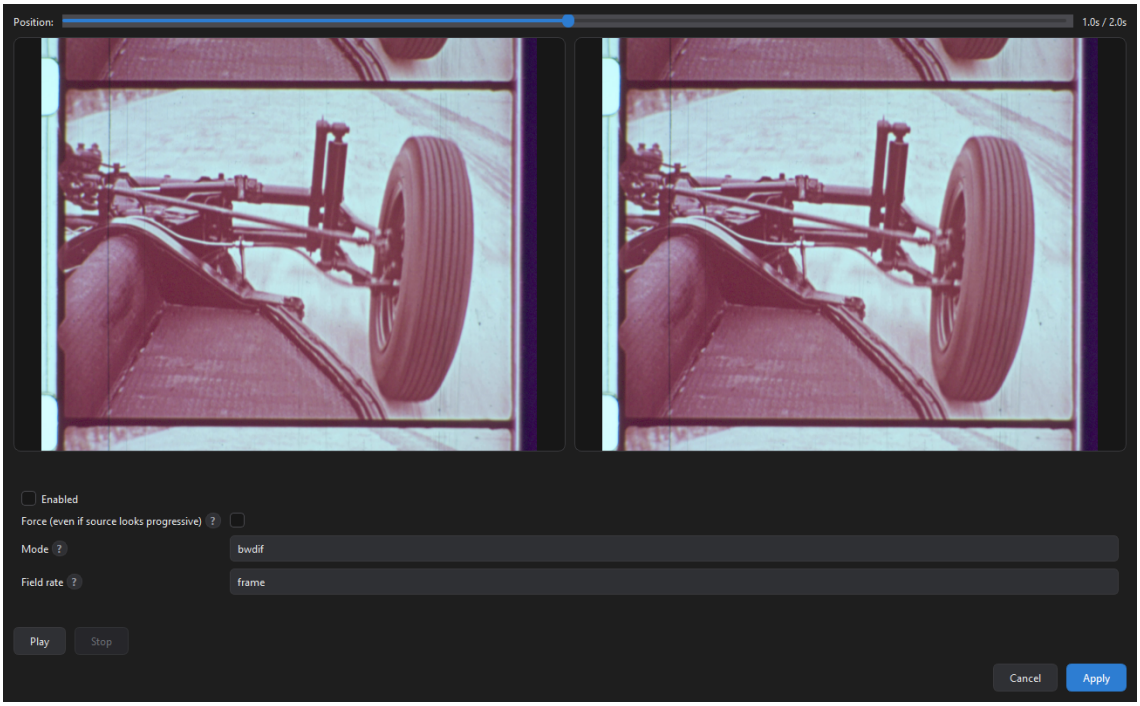
Controls (in the Deinterlace dialog):

- **Force (even if source looks progressive)** — off by default. The tool normally trusts the source's own signalling; Force applies deinterlacing regardless, for sources with wrong metadata.
- **Mode** — **bwdif** (default, best quality) or **yadif** (classic alternative).
- **Field rate** — **frame** (one output frame per interlaced frame; keeps the original frame rate) or **field** (one output frame per field; doubles the frame rate for maximally smooth motion).

Preview it: combing is motion-dependent, so judge the result on a moving section with **Render Preview**, not on a still frame.

> **Note:** Deinterlacing cannot be perfect on badly compressed sources. If interlaced video was compressed or resized *after* interlacing, the fields are smeared into the image ("baked in") and no deinterlacer can fully reconstruct them. Expect improvement, not miracles, on such material.

Also note the interaction described in Section 13: **Dust & Dirt Removal requires interlaced sources to be deinterlaced first** — its tool row tells you when this applies.



The Deinterlace dialog

10. Fade Restore

Old film and prints fade: blacks lift, whites dull, and usually not equally in red, green and blue — which is why faded film drifts pink or yellow. **Fade Restore** corrects this by re-establishing the true black point and white point of each color channel.

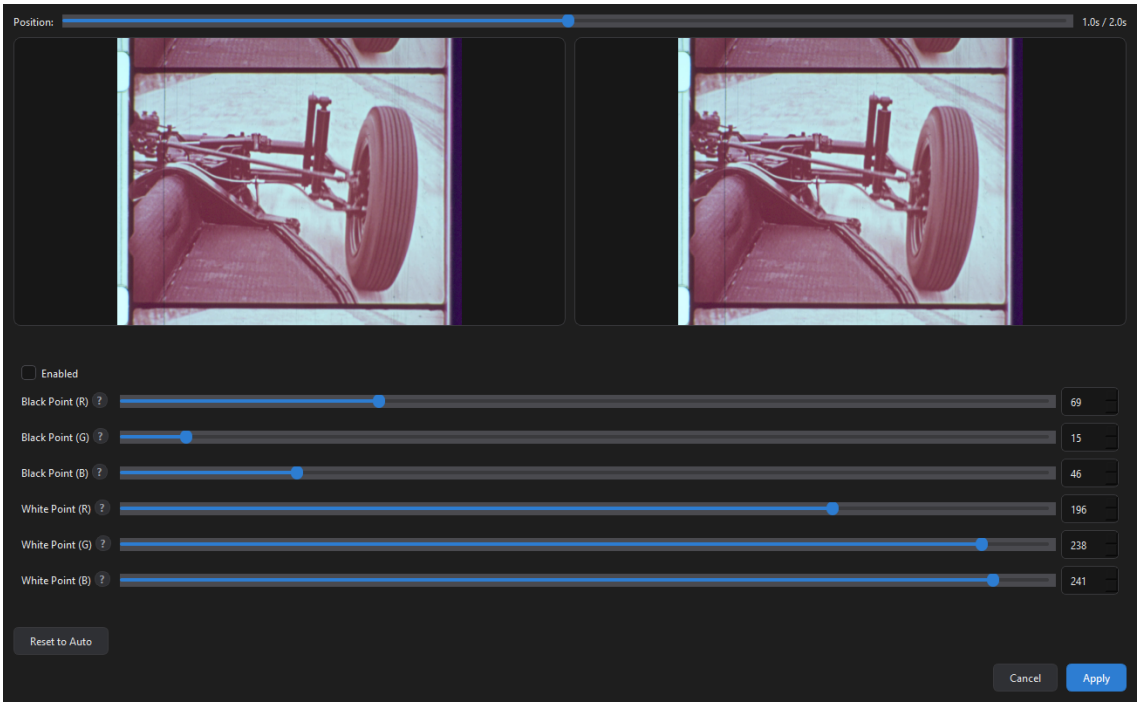
How to use it:

1. Enable **Fade Restore** and click its name to open the dialog.
2. The tool **auto-analyzes** the current frame ("Auto-analyzing frame — sliders will be populated shortly.") and fills in all six sliders: **Black Point (R/G/B)** and **White Point (R/G/B)** (each 0–255).
3. Inspect the After pane. Fine-tune the sliders if needed — small moves go a long way.
4. **Reset to Auto** re-runs the analysis of the current frame if you want to start over, or after moving to a more representative frame.
5. **Apply**, then confirm with a **Render Preview** on a few different scenes.

Limitations and cautions:

- The auto-analysis reads *one frame*. Pick a frame with true blacks and genuine highlights; a frame of sky or a dark interior will mislead it.
- **Avoid over-correction.** Pushing black points up or white points down too far **clips** — shadow and highlight detail is permanently flattened. If large areas go solid black or blank white in the After pane, back off.
- Fading often varies across a reel. Preview several sections; if the fade changes drastically mid-reel, consider restoring the reel in sections, or choose a compromise setting.

Fade Restore pairs naturally with the color tools in Section 11: Fade Restore fixes the *range* of each channel; grading then fixes the *look*.



The Fade Restore dialog with auto-analyzed black and white points

11. Color Tools

Four color tools cover different jobs. All are frame-based, so the Before/After preview (and each dialog's own preview) shows them faithfully; confirm on a few different scenes.

11.1 White Balance

Three simple gain sliders — **Red gain**, **Green gain**, **Blue gain** (0.2–2.0, default 1.0) — for removing an overall color cast. Lower a channel that dominates, or raise its opposite.

11.2 Color Restore

Automatic level restoration for aged material:

- **Auto levels (normalize)** (on by default) continuously re-stretches levels, with **Normalize smoothing (frames)** (default 30) controlling how gradually it adapts over time — higher is steadier, lower follows scene changes faster.
- **Channel independence** (0–1) — at 0 all channels stretch together (preserves the color balance); at 1 each channel stretches on its own (actively removes color casts). The 0.5 default is a good middle ground.
- **Normalize strength** (0–1) scales the whole effect.
- Plus manual **Contrast**, **Brightness**, **Saturation** and **Gamma** controls.

11.3 Color Grading

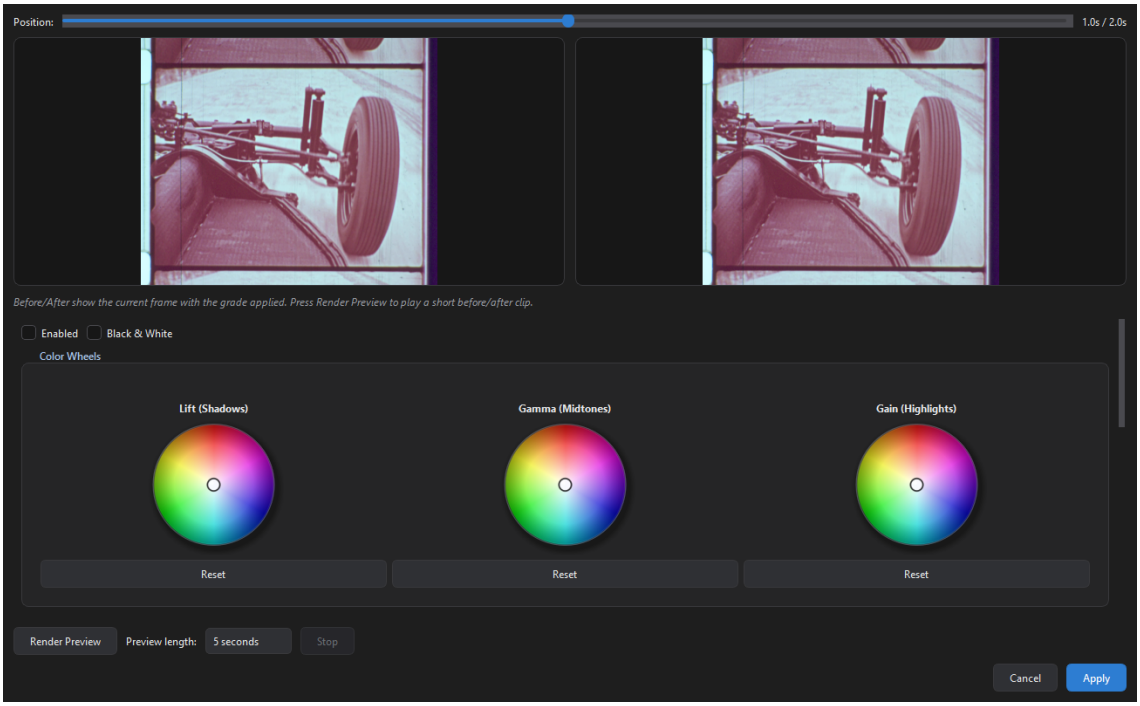
The creative color tool, with its own full-screen dialog:

- Sliders: **Temperature**, **Tint**, **Contrast**, **Brightness**, **Saturation**, **Vibrance** (each −100…+100, default 0). *Temperature* shifts warm/cool; *Tint* shifts green/magenta; *Vibrance* boosts muted colors while protecting already-saturated ones (gentler than Saturation).
- **Color Wheels**: **Lift (Shadows)**, **Gamma (Midtones)**, **Gain (Highlights)** — professional three-way color control, each with its own **Reset**.
- **RGB Curves** for precise per-channel adjustment.
- A **Black & White** option for monochrome conversion.
- The dialog has its own **Render Preview** button so grades can be judged on moving video.

> **Warning:** Watch for clipping while grading. Large Brightness/Contrast moves, or lifting Gain far on one channel, pushes picture information past the limits where it cannot be recovered downstream. Grade on a calibrated monitor if the result is going to a customer.

11.4 Chroma Repair

For color *defects* rather than color *taste* — typical of videotape: color fringing offset from the luminance (fixed with the four **Cb/Cr shift** sliders) and chroma noise / dot crawl (**Chroma noise reduction** with its **threshold** and **patch size**).



The Color Grading dialog: sliders, color wheels and curves with a live preview

12. General Scratch Removal

Scratch Removal is MSS Media Lab's flagship tool, and the most computationally serious one. It targets the classic film defect: **vertical scratches** — lines caused by particles in the camera, projector or scanner gate dragging along the moving film. These run through many consecutive frames, weaving slightly, sometimes bright, sometimes dark.

12.1 How it works (what you need to know)

A scratch and a telegraph pole can look identical in a single frame. What distinguishes them is **behavio ur over time** — a scratch stays near the same horizontal position across frames while real picture content moves with the scene. Scratch Removal therefore analyzes the clip *temporally*: it detects scratch candidates, follows each one from frame to frame as a track, checks that it behaves like physical damage rather than scene structure (so that fence posts, door frames and building edges are left alone), and then repairs each confirmed scratch by rebuilding the damaged columns from the surrounding picture, preserving film grain and texture so the repair is invisible.

This is why it is slower than a simple filter — and why the results are categorically better. **Long processing times on this stage are normal.**

12.2 Settings

Click the **Scratch Removal** name to open its dialog (Before/After panes, **Position** slider, **Timestamp** entry with **Go to Frame**, **< Prev Frame** / **Next Frame >**):



The Scratch Removal dialog

- **Enabled** — the master switch for the tool (same as the row checkbox).
- **Luma mode (RemoveGrain, 0=off)** (0–24, default 17) — how aggressively dust/scratch energy is cleaned from the brightness channel, where most damage lives. Higher cleans more but can

soften fine detail; 0 disables it. The default suits most footage.

- **Chroma mode (RemoveGrain, 0=off)** (0–24, default 17) — the same for color blemishes. Often fine at default or lower.
- **Scratch detection sensitivity (0=off)** (0–10, default 4) — how hard the detector looks for vertical scratch lines. Higher finds fainter scratches but raises the risk of flagging genuine vertical edges; 0 disables vertical scratch repair entirely.
- **Re-detect Scratches** — re-runs the automatic detection at the current settings (the dialog auto-detects when opened: "Auto-detecting vertical scratch lines — please wait.").

12.3 Previewing scratch settings — required reading

The dialog's After pane and the main After pane show a **fast single-frame approximation** of Scratch Removal (the note under the preview says exactly this). It is useful for a first impression, but the real engine is temporal and can only be judged with **Render Preview**:

1. Find the worst scratched section and a clean, detailed section (ideally with real vertical lines — poles, door frames, buildings).
2. Render Preview the scratched section: are the scratches gone? Is the repair invisible in motion?
3. Render Preview the detailed section: is every real vertical edge intact?
4. If faint scratches survive, raise **Scratch detection sensitivity** one step and preview again. If a real edge is being touched, lower it — or handle the stubborn scratch with the confirmed/manual repair in **Scratch Refinement** instead (Section 12.5), which is more surgical than raising global sensitivity.

12.4 What you'll see during a render

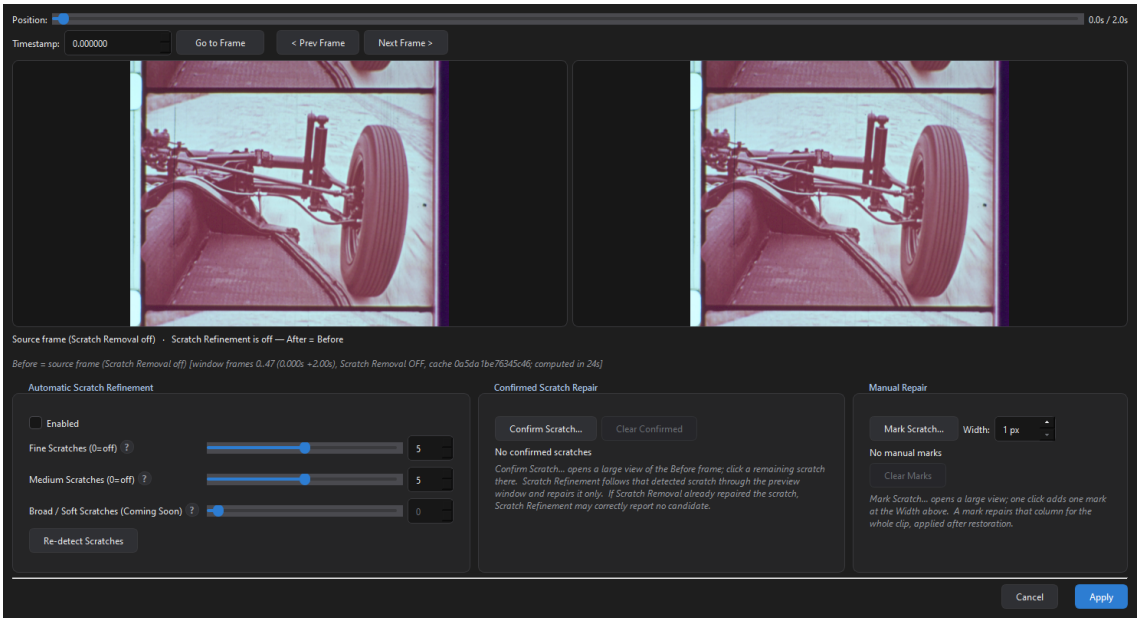
Scratch Removal reports its progress in named substages on the stage status line (Section 21):

- **Bridge · Detection** — finding scratch evidence across the clip;
- **Bridge · Safety Check** — verifying candidates against scene structure;
- **Bridge · Path Extension** — following each scratch's path through the frames;
- **S2 · Track Scan**, **S2 · Promotion**, **S2 · Seeds** — a second detection pass that catches fainter scratch tracks and prepares them for repair;
- **Main Pass** — the actual frame-by-frame repair, usually the longest stage, with a live frame count.

Each substage shows frames done / total, a percentage and its elapsed time. Some early substages move quickly; **Main Pass** is where most of the time goes.

12.5 Scratch Refinement

Scratch Refinement is a second, optional cleanup pass for scratches that remain after Scratch Removal (its tooltip: "*Additional cleanup for scratches remaining after Scratch Removal.*"). Enable it in the Tools list and click its name:



The Scratch Refinement dialog

The dialog has three panels:

- **Automatic Scratch Refinement** — **Enabled**, plus **Fine Scratches (0=off)** and **Medium Scratches (0=off)** sliders (0–10, default 5) for narrow and mid-width residual scratches, and **Re-detect Scratches**. (*Broad / Soft Scratches* appears in the dialog but is marked **Coming Soon** and is not active in this release.)
- **Confirmed Scratch Repair** — **Confirm Scratch…** opens a large view of the Before frame; **click on a remaining scratch** and Scratch Refinement follows *that* detected scratch through the preview window and repairs it specifically. **Clear Confirmed** removes your confirmations. If Scratch Removal already repaired the scratch, a confirmation may correctly report no candidate.
- **Manual Repair** — **Mark Scratch…** opens a large view; **one click adds one mark** at the chosen **Width** (in pixels). A mark repairs that column for the **whole clip**, applied after restoration. **Clear Marks** removes them. This is the last-resort tool for a stubborn scratch at a fixed position.

Because Scratch Refinement is temporal, **it is shown in Render Preview only** — the static panes tell you so. Use **Prepare Scratch Refinement Data** (Section 7.5) before opening the dialog so its preview window is ready.

12.6 Cancelling, and working space

A running Scratch stage can always be cancelled (Section 22.1); partial work is cleaned up automatically. Scratch Removal is also the main consumer of temporary working space — its intermediate streams are written beside your output and removed when the job ends. The storage preflight (Section 19) accounts for this.

13. Dust & Dirt Removal

Dust & Dirt Removal targets the other classic film defect: **transient specks** — dust, dirt and debris that appear on *one* frame and are gone on the next. Its tooltip summarizes the philosophy: "*Removes isolated transient dust and dirt using neighboring frames while preserving image detail. Uncertain defects are left untouched. Best for isolated dark specks and dirt.*"

13.1 How it decides

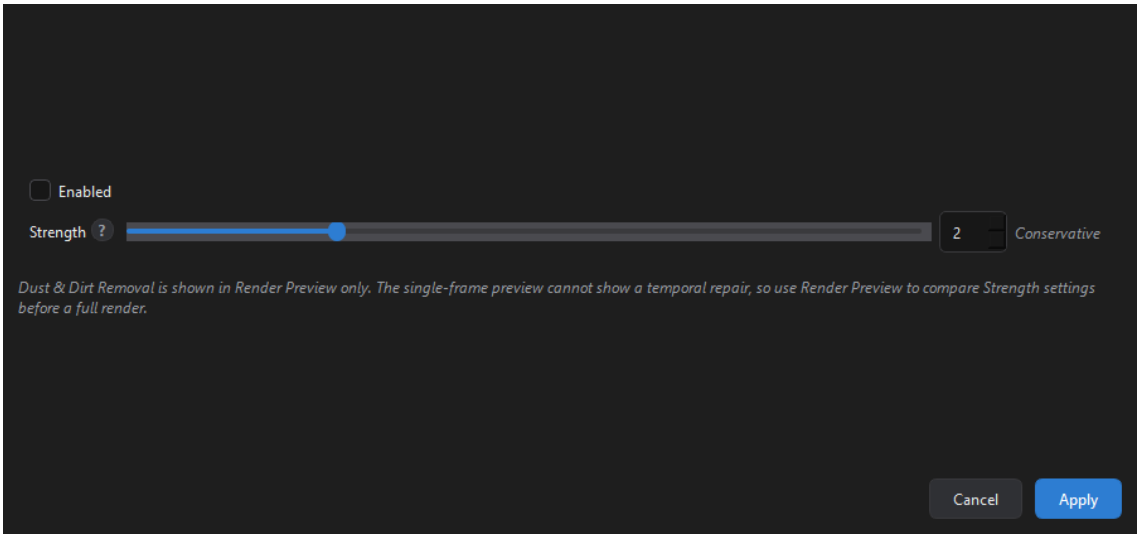
For every candidate speck the tool checks the same place in neighbouring frames (motion-compensated). Something present in this frame but absent in its aligned neighbours is physical dirt; something that persists or moves with the scene is picture. The tool is deliberately **conservative by design**: scratches, frame lines, film edges, hairs, moving content and frames it cannot judge confidently are left untouched at *every* setting. If it is not sure, it does nothing — a missed speck is recoverable, a damaged picture is not.

13.2 Strength

One slider, **Strength**, five positions:

Strength	Name	Character
1	**Minimal**	Repairs only unmistakable dust
2	**Conservative**	**Default.** The validated, cautious setting recommended for delivery work
3	**Standard**	Accepts fainter specks
4	**Strong**	Accepts fainter and smaller specks still
5	**Maximum**	The widest net — most repairs, longest run, most to inspect

Raising Strength never switches the protections off — higher settings simply allow more candidates to be *examined*, and take longer. But more repairs means more places where your inspection matters, so **start at 2 (Conservative)** and only raise it if previews show significant dirt surviving.



The Dust & Dirt Removal Strength setting (2 — Conservative is the default)

13.3 Previewing Dust settings

Dust & Dirt Removal is shown in Render Preview only — the note under the preview panes says so, because the tool's evidence *is* the neighbouring frames. The workflow of Section 7.3 applies with full force:

1. Render Preview a dirty section at Strength 2.
2. If obvious dirt survives, step up to 3 and preview again — compare the same section.
3. Check a clean, detailed, moving section too, especially at Strength 4–5.
4. After the full render, the Activity Log reports the result: `Dust & Dirt Removal: N specks repaired · uncertain areas left unchanged`.

13.4 Availability rules

The tool row itself tells you when Dust & Dirt Removal cannot run:

- "*Dust & Dirt Removal is unavailable while FPS Correction is enabled.*" — FPS Correction changes frame timing, which breaks the neighbour-frame analysis. Choose one or the other for a given job (or run two passes — see Section 27).
- "*Dust & Dirt Removal is not yet available for interlaced footage.*" — enable **Deinterlace** for the job and the row unlocks.

13.5 Dust vs scratches

Dust & Dirt Removal and Scratch Removal are complementary, not interchangeable: a speck lives on one frame; a scratch persists across many. Dust & Dirt deliberately refuses to touch scratch-like structures — that is Scratch Removal's job. Dirty *and* scratched film wants both tools (Section 14).

14. Scratch + Dust Together

For most physically damaged film, the right combination is **Scratch Removal + Dust & Dirt Removal**. They run in the correct order automatically (Scratch first, then Dust), and they cooperate: the dust pass knows which areas the scratch pass repaired.

Preview the combination, not just the parts. Two settings that each look right alone are usually right together, but not always — a strong scratch repair changes the picture the dust detector sees. So after dialing in each tool separately:

1. Enable both at your chosen settings.
2. Render Preview the worst section and one normal section.
3. Inspect, adjust whichever tool needs it, and preview once more before the full render.

With both temporal tools enabled, expect the longest render times of any configuration — a long reel is an overnight job. The storage preflight will also show a larger temporary-space estimate, since both engines write intermediate streams.

15. Other Restoration Tools

Every remaining tool in the released Tools list, in processing order. Each opens a dialog with its own Before/After preview.

15.1 Crop Rotate

Straightens a tilted scan (**Rotation / Straighten**, ±45°) and crops away scanner borders, sprocket areas or damaged edges (**Crop X / Y / Width / Height**; 0 = full frame). The dialog provides an interactive crop box over the frame. Runs before everything else, so all later tools see the cropped picture.

15.2 Dropout Repair

For analog tape **dropouts** — horizontal white/black streaks where the tape lost signal for a line or two. **Temporal radius (frames, 0=off)** (default 1) controls how many neighbouring frames are consulted; **Percentile** (default 0.5) selects how replacement values are chosen. A dropout that exists on a single frame is rebuilt from its neighbours.

15.3 Denoise

General-purpose video noise reduction with separate spatial and temporal strengths for luma and chroma (**Luma/Chroma spatial**, **Luma/Chroma temporal**). Spatial smoothing works within the frame; temporal smoothing averages across frames and is more effective on static grain/noise but can trail on fast motion. Moderate values preserve the organic look of film.

15.4 Degrain (Film Grain Reduction)

Dedicated film-grain reduction using patch-based analysis: **Strength (0 = off)** (default 3.0), **Patch size** (default 7) and **Research window** (default 15). Larger research windows find better matches (slower, better). Use Degrain rather than Denoise when the dominant "noise" is actual film grain.

> **Tip:** Grain is part of film's character. Fully de-grained film looks like video. Consider reducing grain, not eliminating it — and see **Add Grain** (15.9) for the finishing counterpart.

15.5 Deflicker

Evens out frame-to-frame brightness pumping — endemic in hand-cranked and aged film, and in some telecine transfers. **Window size (frames)** (default 5) sets how many frames the brightness is smoothed over; **Mode** selects the smoothing statistic (default **pm**; several alternatives including **median** for impulsive flicker).

15.6 Sprocket-Hole Stabilization

For film scanned with its **perforations visible** in frame: locks the picture to the physical sprocket holes — the most faithful stabilization possible for film, because it recovers the film's true registration.

1. Enable the tool; the Preview panel switches to marker mode: "*Drag a marker to reposition it; drag its edges/corners to resize it over a perforation hole. The stabilized result updates live on the right.*"
2. Place the marker(s) over perforation hole(s). The tool's checkbox stays greyed out until at least one marker exists ("Mark perforation positions in the Preview panel first").

3. In its dialog: **Search radius (px)** (default 25) — how far a perforation may wander frame to frame; **Edge fill mode** — **black**, **replicate** or **reflect** for the margins exposed by stabilization.

Runs as a frame-sequence stage together with the AI tools and can absorb the Crop Rotate settings, so the AI stages see stabilized, cropped frames.

15.7 Stabilize

General motion stabilization for handheld or unsteady footage (when there are no usable perforations). **Shakiness** (how shaky the source is, default 5), **Accuracy** (default 15), **Smoothing (frames)** (default 10 — higher = steadier, more cropping), **Lock to fixed reference frame (tripod)** for locked-down shots, **Auto zoom** (**off / adaptive / constant**) plus manual **Zoom %**, **Smoothing algorithm** (**gauss**/avg) and **Interpolation** quality. Two-pass: it first analyzes motion ("Analyzing stabilization"), then renders.

15.8 AI Upscale

Enlarges the footage 2×, 3× or 4× using AI reconstruction. Runs as a frame-sequence stage (frames are exported, processed, and re-encoded — slower but highest quality).

- **Engine**: **Bicubic (no GPU required)** — traditional enlargement, softer, runs anywhere; **Real-ESRGAN (min ~2 GB VRAM)** — the default, AI reconstruction of detail, needs an NVIDIA GPU; **SeedVR2 (min ~24 GB VRAM)** — the highest-quality optional engine for professional workstations, installed separately on demand.
- **Scale**: 2 / 3 / 4 — match your delivery target (2× for SD→HD, 4× for SD→4K).
- **Model** (Real-ESRGAN): **realesrgan-x4plus** (recommended for real film/video), **realesr-general-x4v3** (lighter/faster), plus two anime-oriented models not suited to film transfer work.
- **Tile size (0=auto)** — leave at 0 unless you hit GPU memory errors, then try 128 or 256.
- **TTA mode** — marginally higher quality at roughly **8× the processing time**; only for when quality is everything.

15.9 AI Frame Interpolation (RIFE)

Generates intermediate frames with AI to raise the frame rate — e.g. to play 16 fps or 18 fps film smoothly at 60 fps without judder. **Model** (default **rife-v4.6**), **Target FPS** (default 60), **UHD mode** for 4K sources, and **Scene change detection** (on by default, so no false in-between frames are invented across cuts). Requires an NVIDIA GPU; runs as a frame-sequence stage.

15.10 Add Grain

The finishing touch after heavy cleanup: adds back a fine, film-like grain so the restored picture doesn't look sterile, and masks residual processing artifacts. **Luma strength** (default 8), **Chroma strength** (default 0), **Temporal (vary per frame)** — leave on for a natural, living grain.

15.11 FPS Correction

Fixes wrongly-timed transfers (e.g. 8mm film captured at 30 fps that should play at 16/18 fps):

- **Method**: **reinterpret** — keeps every frame, changes the playback rate (the audio is automatically time-stretched to match, losslessly re-encoded); or **interpolate** — resamples the frame timing to the target rate.

- **Target FPS** (default 24).

Remember: FPS Correction and Dust & Dirt Removal cannot run in the same job (Section 13.4).

15.12 Watermark

Overlays a logo image on the output: **Load Logo Image…**, a **position** selector (default bottom-right), **opacity** (default 70%) and size control. Typical for shop branding on preview/delivery copies.

16. Output and Encoding

The **Encode** entry at the bottom of the Tools list controls the output format. Its checkbox is the master **Encode On / Off** switch.

16.1 Encode Off (passthrough)

With Encode **disabled**, the output keeps the source file's own container, codec and pixel format — the restored frames are encoded to match the source as closely as possible. Use this when the delivery format must mirror the source. (With Encode off and *no* tools enabled that force re-encoding, the source is carried through unchanged.)

16.2 Output mode: video file or image sequence

With Encode enabled, **Output mode** chooses:

- **Video file** — a single video container (MP4, MOV, MKV…). The container follows the codec: H.264 and H.265 (CPU or GPU) and GPU AV1 produce `.mp4`; ProRes produces `.mov`; FFV1 and CPU AV1 produce `.mkv`.
- **Image sequence** — every frame exported as a numbered image into a subfolder named after the output file. **Image format**: **TIFF** ("*lossless, large files, best for professional editing and archiving*") or **PNG** ("*lossless, compressed, smaller files, widely supported*" — typically 30–50% smaller). Frames are numbered `name_frame_00000001.tiff` and exported in full RGB. Audio does not apply in this mode.

16.3 Codec (video mode)

Choice (as shown in the program)	Use it for
Match my footage automatically — Recommended for most users	Reads your source and picks H.264 or H.265 with a resolution-appropriate quality target. The right default when you don't have a format requirement.
H.264 (MP4) — Most compatible, plays on everything, good quality	Delivery to customers; universal playback.
H.265 (MP4) — Better quality than H.264 at smaller file size, modern devices	Smaller delivery files where playback devices are modern.
Apple ProRes — Professional lossless quality, very large files, best for editing	Editing intermediates and professional delivery.
FFV1 — Completely lossless, largest files, best for archiving	True archival masters — mathematically lossless.
AV1 — Best quality, smallest file size, very slow to encode, cutting edge	Smallest files; very slow on CPU.

Choice (as shown in the program)	Use it for
H.264 / H.265 / AV1 (GPU-accelerated)	The same formats encoded by the NVIDIA GPU — much faster. Falls back automatically to the CPU codec if no NVIDIA GPU is present.

16.4 Quality and speed controls

- **Quality (CRF, lower = better)** (0–51, default 18): the main quality dial for H.264/H.265/AV1 (CPU and GPU). 18 is excellent, near-transparent quality; 18–23 is the recommended delivery range; 0 is lossless; never go above 28 for transfer work.
- **Encode speed preset** (**ultrafast** … **veryslow**, default **medium**): slower presets compress more efficiently (smaller files at equal quality) but take longer. For GPU codecs the preset maps onto the GPU encoder's own quality levels.
- **ProRes profile (0–5)** (default 3): 0 Proxy · 1 LT · 2 Standard · **3 HQ (recommended)** · 4 4444 · 5 4444 XQ.
- **Pixel format**: **yuv420p — Standard, plays everywhere** (correct for customer delivery) · **yuv422p10le — Higher color quality, professional use** (10-bit, archival masters, further editing) · **yuv444p10le — Highest color quality, professional archiving** (very large; not universally playable).

16.5 GPU format support is checked for you

At startup, MSS Media Lab probes what the installed GPU's encoder actually supports. If a queued job asks for a GPU codec/pixel-format combination the GPU cannot encode (for example, 10-bit 4:4:4 on a GPU without that mode), **Start Queue** refuses that job with the dialog **"Encoding Format Not Supported — This GPU does not support the selected encoding format. Choose another pixel format or codec."** Nothing starts until the setting is changed, so a long queue can never die hours in on an unsupported format. See also Section 17.

16.6 Output naming, Replace and versions

The output name comes from the **Filename template** in **Output Naming** (Section 5.4): `{original_name}` plus optional `{date}` / `{time}` placeholders, with a live preview of the resolved name. If the output file already exists when the queue starts, the program asks per job: **Replace**, **Save as new version** (default — appends `_v2`, `_v3`, … to the name), or **Cancel**.

17. GPU Encoding

- GPU encoding uses the NVIDIA encoder (NVENC) through the bundled runtime. It requires an **NVIDIA GPU with a current driver**; there is nothing else to install.
- **At startup** the program tests the GPU's encode capabilities in the background. Only combinations your GPU can actually encode are allowed to start (Section 16.5); unsupported ones are blocked with a clear message. Different GPU generations support different formats — AV1 encoding in particular exists only on recent generations, and high-bit-depth/4:4:4 modes vary by model. This is a property of the GPU hardware, not a fault.
- If a job configured for a GPU codec runs on a machine with **no NVIDIA GPU at all**, it does not fail: the equivalent CPU codec is used automatically (H.264 GPU → H.264 CPU, and so on). The result is the same format, just encoded more slowly.
- GPU encoding accelerates the final **encode**; the restoration stages have their own CPU/GPU paths chosen by the performance profile (Section 5.6). Pressing **Start** immediately after launch can briefly wait on the GPU capability check finishing.

18. Output Folder and Working Storage

18.1 Where finished files go

By default, restored files are written to **your Windows Videos folder** → `MSS Media Lab` — visible, user-writable, easy to find. To choose a different destination, expand **Output Naming** (the » button) and click the folder **Browse** button. Each queue run writes to the folder shown there; jobs in the same queue can even target folders on different drives (Section 20).

18.2 Naming

The **Filename template** builds each output name: the default is the source name; `{date}` (YYYY-MM-DD) and `{time}` (HH-MM-SS) placeholders can be added. The grey line below previews the resolved filename for the selected job.

18.3 Temporary working data: `.mss_work`

While a job (or a Render Preview) runs, its large temporary working files live in a hidden folder named `.mss_work` **on the same drive, beside your output folder**. This is deliberate: the heavy intermediate traffic happens on the drive you chose for the output, so a fast output drive helps the whole render — and the preflight can check one drive for both.

- `.mss_work` is created when a job starts and **cleaned up automatically** when the job finishes, is cancelled, fails, or the program closes. If the program is terminated abnormally (power loss, forced kill), the next launch removes the orphaned working data safely.
- **Do not open, edit or delete anything inside** `.mss_work` **while a job is running.** There is never a reason to work in this folder manually; its contents are not usable files.
- Your own files in the output folder are never touched by this cleanup.

> **Note:** You do not need to configure anything in Windows AppData folders, and you should not modify them. Settings, history and caches are managed entirely by the program.

18.4 Free space

Because working files live beside the output, **the output drive needs the free space** — for the finished file *and* the temporaries. The storage preflight (next section) does the arithmetic for you before every run.

19. Storage Preflight

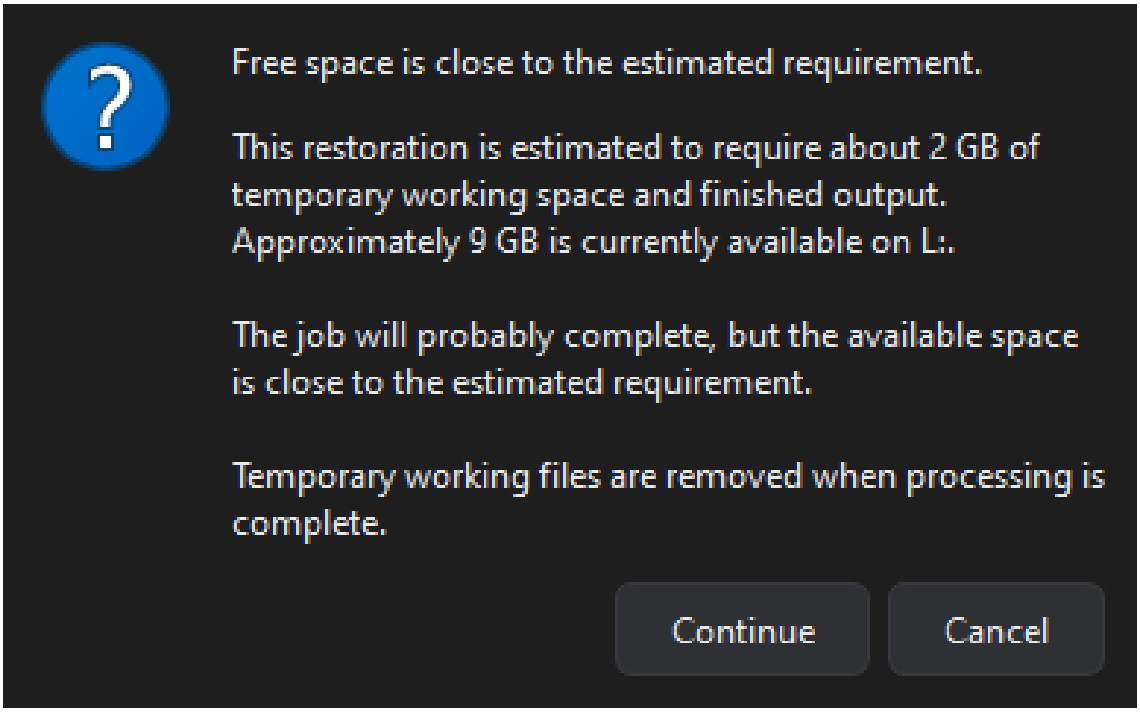
Between **Start Queue** and the actual render, MSS Media Lab measures and estimates every job's storage needs ("Checking available storage…" appears on the progress bar — this takes a few seconds per job). For every drive the queue will touch, it estimates the finished output size plus the peak temporary working space, adds safety margin, and reaches one of three verdicts:

- **SAFE** — plenty of room; the queue starts silently. The Activity Log still records the result per drive, e.g. `[Storage] L: (working files + output): estimate 210 GB, minimum 227 GB, comfortable 258 GB, free 580 GB -> SAFE`.
- **WARNING** — "*Free space is close to the estimated requirement.*" The job would probably complete, but the margin is thin. You choose **Continue** or **Cancel**.
- **INSUFFICIENT** — "*Not enough free space to start.*" The message states how much is needed on which drive and how much more must be freed. The queue does not start.

How the margins work, in plain terms: the *minimum* is the estimate plus 5%, plus a fixed **6 GB reserve** that is always kept free for Windows and the drive itself; the *comfortable* level is the estimate plus 20% plus the same reserve. Below comfortable you are warned; below minimum you are stopped.

Additional protections:

- **Runtime disk guard.** Estimates can't foresee everything, so free space is also monitored *while* the job runs. If a drive falls to the 6 GB reserve mid-render, the job is stopped cleanly (and its temporaries cleaned up) rather than letting the drive run completely full — a full system drive can destabilize Windows itself.
- **Per-drive checking for multi-drive queues.** When queued jobs output to different drives, each drive gets its own verdict covering exactly what will land on it.
- **File-size limits.** A drive formatted **FAT32** cannot store any file over 4 GB, no matter how much free space it has. If a job would write larger files there (most restoration jobs do), the preflight reports it as INSUFFICIENT with the message to choose an output folder on an **NTFS or exFAT** drive.
- The dialog always notes: "*Temporary working files are removed when processing is complete.*"



A storage WARNING: the job would probably complete, but the margin is thin

Why estimates are large for lossless/high-resolution work: restoration intermediates are kept at full quality, so a 4K lossless workflow can need several times the size of the finished file in temporary space. This is the main reason to keep a large, fast NVMe drive for output.

20. The Queue

MSS Media Lab processes jobs through a queue, so a whole batch — or a whole night's work — runs unattended.

- **Adding jobs:** every loaded file/sequence is a queue job with its own tools, settings and output. Use the chip checkboxes to include/exclude jobs from the next run without removing them.
- **Starting: Start Queue** first resolves output-name conflicts (Section 16.6), then runs the storage preflight (Section 19), then processes the enabled Pending jobs in order, one at a time. The label by the progress bar tracks "File N of M".
- **Multiple drives:** jobs may target different output folders on different drives in one queue; the preflight checks each drive separately and each job's working files go beside its own output.
- **Cancel** stops the queue: the current job is cancelled and cleaned up (Section 22.1); its status becomes *Cancelled* and remaining jobs are not started.
- **Failures don't stop the line:** if a job fails, its status shows *Failed* with the reason, its temporaries are removed, and the queue continues with the next job. You can fix the issue and re-run just the failed job later (its checkbox, then Start Queue).
- **Recovery:** the queue's state is saved continuously. If the program closes unexpectedly mid-queue, the next launch asks: "*MSS Media Lab closed unexpectedly during a render queue. Resume the unfinished jobs, or discard them and start fresh?*" — **Resume Queue** deletes any partial output of the interrupted job and re-renders it from the start (a job is never resumed from a half-written file), then continues the queue. **Discard** clears it.
- **Re-render:** right-click a Done job → **Re-render…** to run it again (the output-conflict dialog lets you version the new result).

21. Live Progress

While a job runs you can see, at all times:

- **The queue chip** — status, overall percentage and current stage, e.g. `[Running 26% - Scratch Removal · Main Pass]`.
- **The progress bar** — the whole job, 0–100%, with "File N of M" beside it.
- **The stage status line** (under the run controls) — the active stage and substage with its own counters: `Scratch Removal — Main Pass — 1 / 48 frames — 2% — Elapsed 00:00:14`. Frames done / total and percent appear whenever the stage has a meaningful frame count; stages without one show just their name and elapsed time — no invented percentages.
- **The Activity Log** — a progress line at least once a minute during long stages, plus per-stage summaries.

Reading it correctly:

- Fast stages (color, levels, sharpening run inside a single encode pass) mostly move the **overall** progress bar; the long temporal stages (Scratch substages, **Dust & Dirt Removal**, **Final Encode**) each get detailed stage-line treatment.
- **There is no time-remaining estimate.** The program deliberately shows measured facts — frames, percent, elapsed — rather than predictions that would be wrong for exactly the material restoration handles.
- **How to tell it's still working** during a long Scratch or Dust stage: the stage line's *Elapsed* clock ticks every second, the frame count climbs (sometimes slowly — high-resolution Main Pass frames can take seconds each), and the Activity Log gains a progress line at least every minute. A render that has genuinely stopped produces a *Failed* status and a message — silence plus a ticking clock means it is working.

22. Cancel, Close and Failure Recovery

22.1 Cancelling a job

Press **Cancel**. The running stage is told to stop, worker processes shut down, the job's `.mss_work` temporaries are removed, no partial output file is left pretending to be a result, and the job shows *Cancelled*. The stage status line freezes at the moment of cancellation until the job reports its end. Cancelling is always safe — nothing of your source is ever at risk.

22.2 Closing the program

- **While idle:** closes immediately (asking about unsaved project changes if any).
- **While processing:** the running work is cancelled and the window briefly shows "*closing, finishing background work…*" while engines shut down cleanly — normally a second or two. The interrupted job is remembered as unfinished.
- **Next launch after an interrupted queue:** the **Recover Previous Session** prompt offers **Resume Queue** (re-render the interrupted job from scratch, then continue) or **Discard**.

22.3 Failures

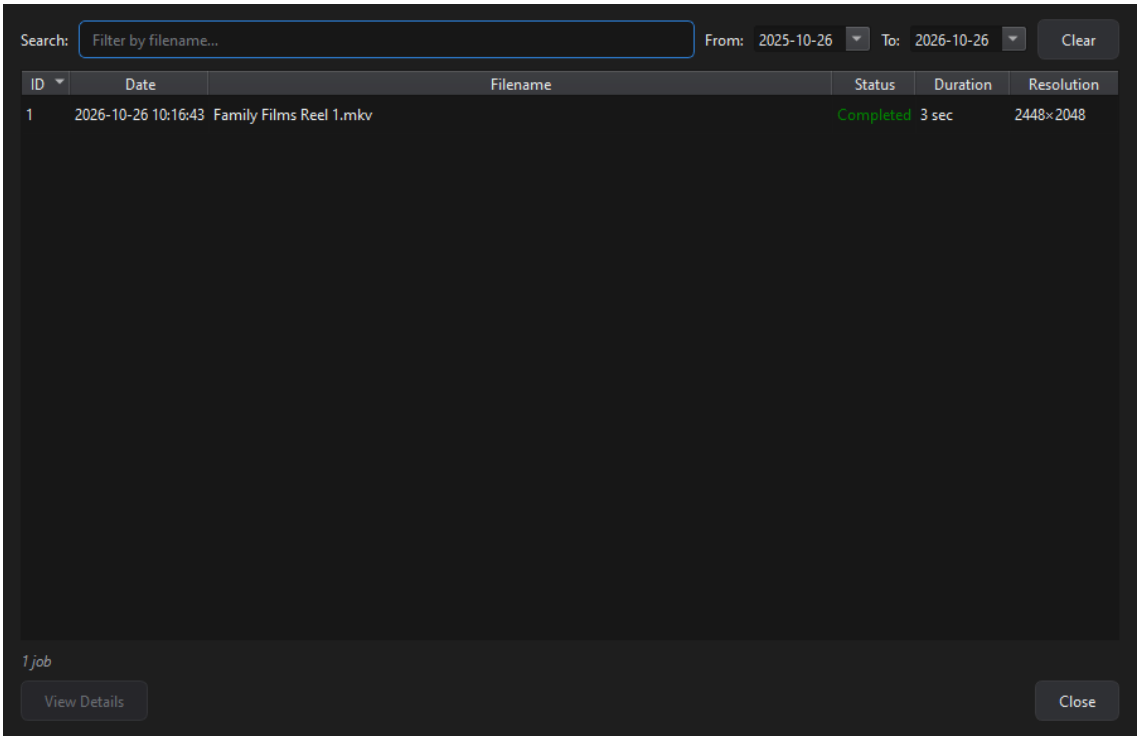
A failed job shows *Failed* with a reason (for example, a worker process that died, or the runtime disk guard stopping a drive-full situation — Section 19). Its temporary files are cleaned automatically; the rest of the queue continues. After fixing the cause (usually freeing disk space or adjusting a setting), re-run the job. Starting a fresh job after a failure requires nothing special — cleanup has already happened, and any stale working folder from an abnormal termination is removed at the next launch.

> **Warning:** Never manually delete working folders (`.mss_work`) while a job is running — cancel first. After a cancel/failure/crash, the program's own cleanup handles them.

23. Job History, Smart Analyze and Business Settings

23.1 Job History

History → View Job History... opens a searchable record of every rendered job: a table of **ID, Date, Filename, Status, Duration, Resolution**, with a **Search** box and **From / To** date filters (and **Clear**). Double-click a row for the detail view — the job's full settings as rendered — and use **Export Report (.txt)...** or **Print...** for a customer-facing record of the work performed. History persists across sessions and uninstalls.



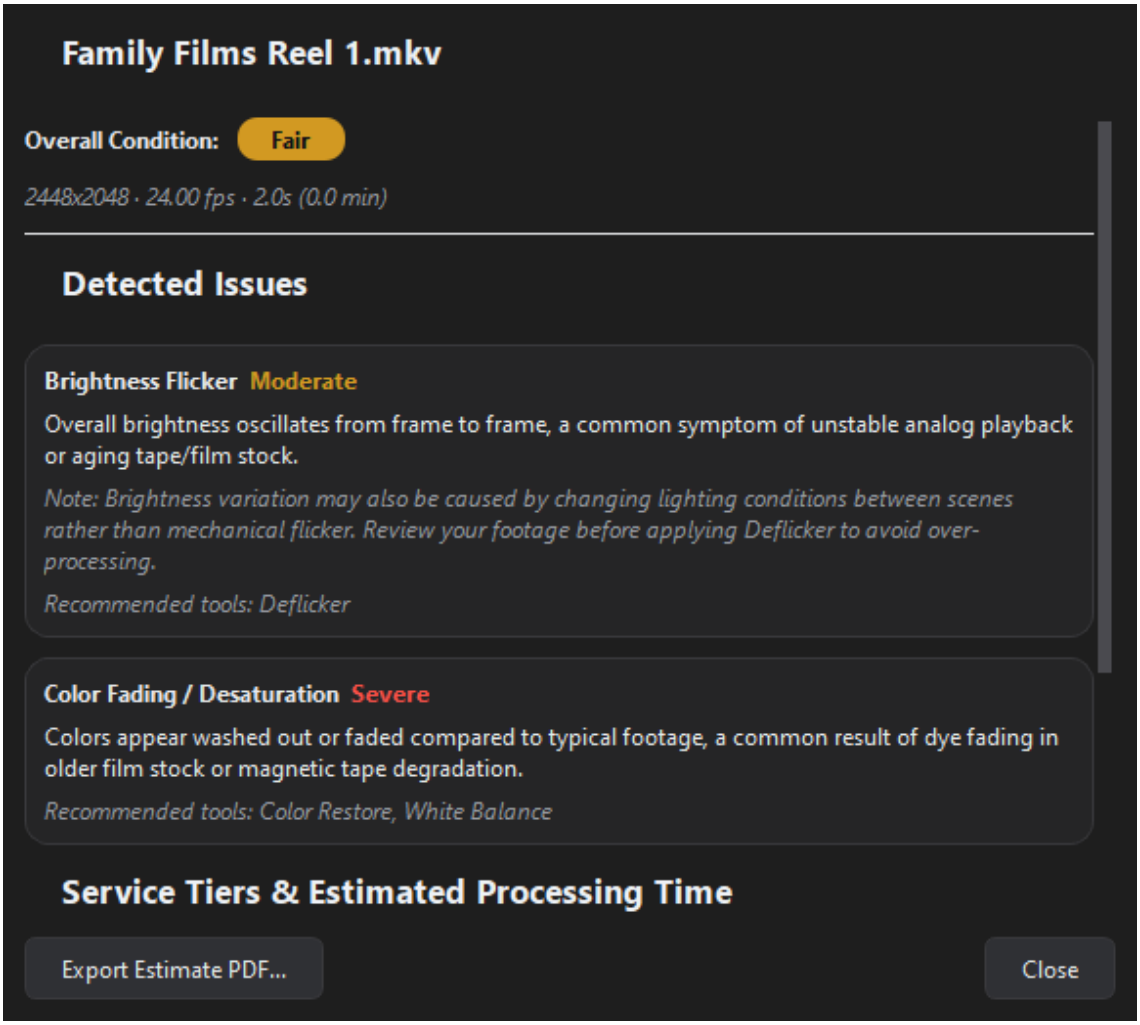
Job History

23.2 Smart Analyze

Select a job and press **Smart Analyze**: an automated diagnostic pass runs over the source and reports:

- an **Overall Condition** rating;
- **Detected Issues** with severity badges — noise/grain, flicker, color fading/desaturation, low contrast, dropout/damaged frames, black/blank segments — each with a plain-language description and its **recommended tools**;
- **Service Tiers & Estimated Processing Time** — approximate processing times on *this* computer's hardware for tiered restoration packages, with prices when an hourly rate is configured.

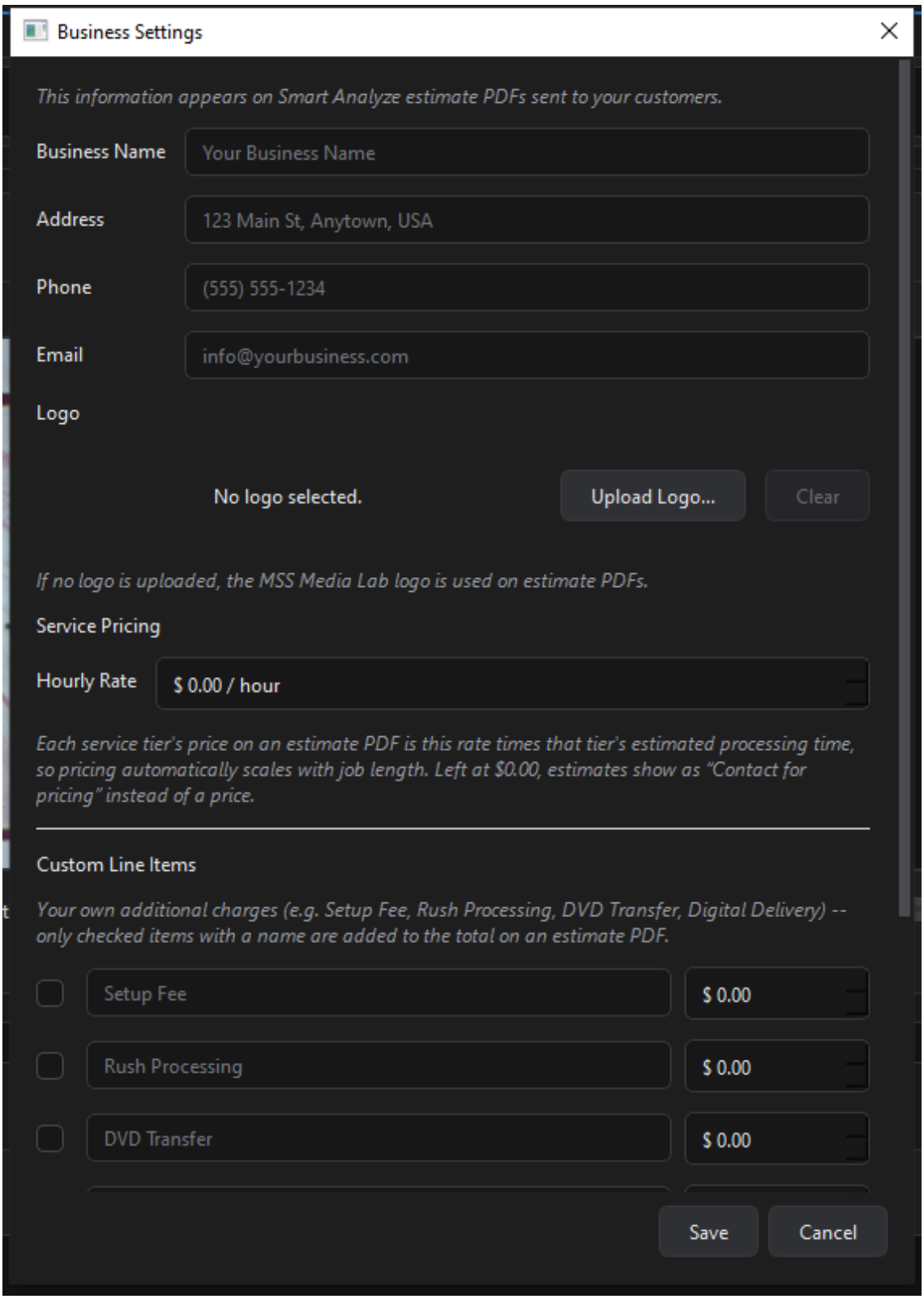
Export Estimate PDF... generates a customer-ready estimate document. It is an estimating aid for transfer shops, not a precision measurement — treat the recommendations as a starting point for the preview-driven workflow of Section 7.



Smart Analyze results

23.3 Business Settings

File → **Business Settings…** personalizes the estimate PDFs: business name, address, phone, email, your **logo** (**Upload Logo…** — otherwise the MSS Media Lab logo is used), an **Hourly Rate** (each tier's price is this rate times its estimated processing time — left at $0.00, estimates show "Contact for pricing"), and **Custom Line Items** (setup fee, rush processing, media transfer…). **Save** stores them for all future estimates.

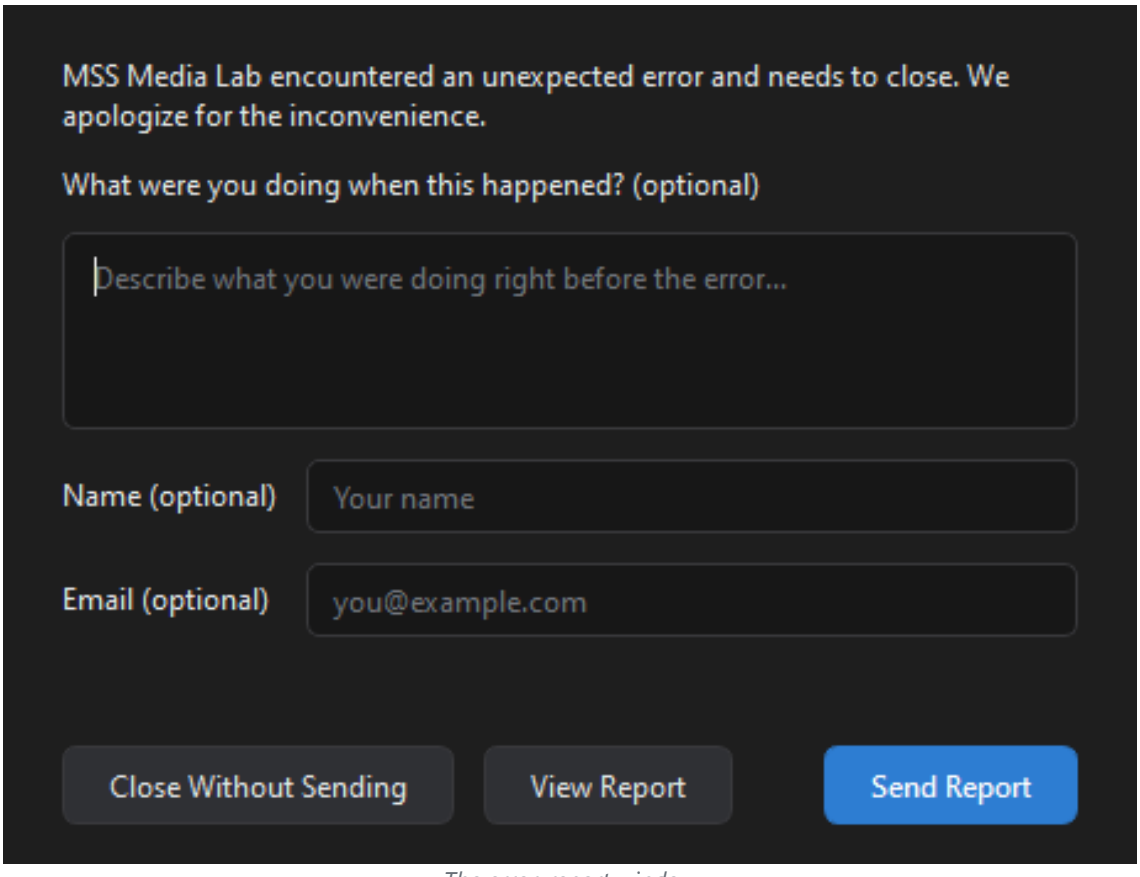


Business Settings

24. Crash Reporting

If the program hits an unexpected error, the **MSS Media Lab - Unexpected Error** window appears. What happens, in order:

1. **A full report is saved on your computer first**, regardless of what you choose next — so no information is lost.
2. The window offers an optional description ("What were you doing when this happened?") and optional name/email so Motion Scan Systems can follow up.
3. **View Report** shows the complete contents of the report before anything is sent — you can read exactly what would be transmitted. The report contains technical information about the error and program state; review it if you have any concern.
4. **Send Report** transmits it securely to Motion Scan Systems (delivered to mss@motionscansystems.com). You will see confirmation that it was delivered, with a reference, or a clear message if sending failed (the local copy always remains).
5. **Close Without Sending** keeps everything local.



The error-report window

When requesting support, the most useful things to provide are: what you were doing when it happened, the source material's resolution/duration/format, which tools were enabled, and — if you sent a crash report — the confirmation reference. Your queue is protected by session recovery (Section 22.2), so after a crash, restart the program and choose **Resume Queue**.

25. File Format and Quality Guidance

Practical recommendations using the released output options (Section 16):

Purpose	Recommended setting
Archival / preservation master	**FFV1** (completely lossless, .mkv), pixel format **yuv422p10le** — or a **TIFF image sequence** for frame-level archives. Large, but mathematically exact.
Restoration master for further editing	**Apple ProRes**, profile **3 (HQ)**, **yuv422p10le**, .mov — drops straight into Premiere / Final Cut / Resolve. ProRes 4444 (profile 4) when you need the absolute maximum.
Delivery / viewing copy	**H.264 (MP4)**, CRF **18–23**, **yuv420p** — plays everywhere. Use the GPU-accelerated H.264 for speed; use **H.265** for smaller files on modern devices.
Smallest high-quality files	**AV1** (GPU-accelerated if your GPU supports it; the CPU encoder is very slow).
Frame-accurate hand-off to compositing / frame tools	**Image sequence**: **TIFF** (largest, universal in pro tools) or **PNG** (lossless, ~30–50% smaller).
Match the customer's source format	**Encode Off** (passthrough of container/codec/pixel format).

The golden rule of a transfer shop: **make one high-quality master first** (FFV1 or ProRes HQ), inspect and keep it, then generate delivery copies from your editor or by re-rendering — never make the lossy delivery file your only output of a long restoration.

26. High-Resolution Workflows

- **SD and HD (up to 1080p).** Comfortable on the recommended hardware; 16 GB RAM machines handle HD at reduced parallelism. Render Previews are quick — use them liberally.
- **2K / 2.5K film scans.** The sweet spot the restoration tools were built around. 32 GB RAM recommended; budget tens to a couple of hundred GB of temporary space for long reels with Scratch + Dust (the preflight will tell you exactly).
- **4K and above.** Fully supported for the general pipeline; the temporal tools are memory-intensive at this size, and on machines without enough RAM, Scratch/Dust on ~4K×3K scans is refused with a clear message rather than attempted and failed. 64 GB RAM is the comfortable tier. Expect per-frame Main Pass times measured in seconds and plan overnight renders. Temporary space scales with resolution *squared* — a 4K lossless workflow can need several hundred GB free.
- **High-bit-depth scanner material.** Load it as a TIFF/PNG image sequence (Section 6.2); choose a 10-bit pixel format (**yuv422p10le** / **yuv444p10le**) with ProRes or FFV1 for the master so the extra depth survives into the output.
- **GPU implications.** Higher resolutions raise VRAM use for the AI tools — AI Upscale's tile size can be lowered if VRAM runs out (Section 15.8), and the performance profile (Section 5.6) adapts stage algorithms to your GPU's memory.

27. Common Workflows

Concise starting points — every one of them still begins and ends with Render Preview on representative sections.

Scanned 8mm / Super 8 home movies Crop Rotate (straighten, trim scanner edges) → Scratch Removal (default sensitivity 4) → Dust & Dirt Removal (Strength 2) → Deflicker → Fade Restore (auto) → Color Grading to taste → mild Sharpening → FFV1 or ProRes HQ master. If scanned with visible perforations: Sprocket-Hole Stabilization instead of Stabilize. For smooth playback of 16/18 fps material on modern screens, a *second* pass on the restored master with AI Frame Interpolation to 60 fps (kept separate because Dust and FPS/timing changes shouldn't share a job).

16mm / 35mm film scan (archive reel) Image-sequence import at the scan's frame rate → Crop Rotate → Scratch Removal → Dust & Dirt Removal → Deflicker → Fade Restore → minimal grading → **no Degrain** (keep the grain for archive) → FFV1 yuv422p10le master + TIFF sequence if the archive requires frames.

Faded color film Fade Restore first (auto-analyze on a frame with real blacks and highlights) → Color Restore (normalize, channel independence ~0.5) → Color Grading for the final look → preview several scenes — fade varies across reels.

Badly scratched film Scratch Removal: preview at sensitivity 4, raise stepwise only if faint scratches survive → enable Scratch Refinement; use **Confirm Scratch…** on survivors in the preview window; **Mark Scratch…** for a stubborn fixed-position scratch → Render Preview the worst section *and* a detailed clean section every time you change a setting.

Dusty/dirty but unscratched film Dust & Dirt Removal alone, Strength 2 → Render Preview a dirty section → raise to 3 only if clearly needed → check the Activity Log's "specks repaired" summary after the render.

Interlaced VHS / video transfer Deinterlace (bwdif; **field** rate if you want maximum motion smoothness) → Chroma Repair (shift/denoise for tape color) → Dropout Repair → Denoise (temporal-leaning) → White Balance / grading → H.264 or H.265 delivery. Dust & Dirt unlocks once Deinterlace is on, and helps with tape debris too.

Film that survives only as a videotape transfer Treat as video first: Deinterlace → Dropout Repair → then the film chain: Scratch Removal / Dust & Dirt → Deflicker → Fade Restore → grading. Expect limits — tape generation loss and baked-in artifacts cap what restoration can recover (Section 9's note applies).

Full combined restoration The order of Section 8, previewed at each major step. Enable the temporal heavyweights (Scratch, Refinement, Dust) only after their settings are preview-proven; render overnight to an FFV1/ProRes master; produce delivery copies from the master.

28. Troubleshooting

The application will not launch. Check Windows is 64-bit Windows 10 or newer. Try launching from the Start Menu shortcut. If a previous session crashed, launch once more — startup cleanup may simply need a moment. If it persists, reinstall (settings and history are preserved) and contact support with your crash report reference if one was shown.

Activation problems. See Section 4.5 — key typos, no internet, or the key active on another machine (deactivate it there) cover nearly all cases.

"Encoding Format Not Supported" when starting the queue. Your GPU cannot encode the selected codec/pixel-format combination (commonly AV1 or 10-bit/4:4:4 modes on older GPUs). Choose another pixel format or codec — e.g. yuv420p, or the CPU equivalent — or encode the master with FFV1/ProRes instead.

"Not enough free space to start." / storage warnings. The preflight found the output drive short (Section 19). Free the stated amount, or point the output folder at a roomier drive — the temporary working files follow the output automatically.

Output drive is FAT32. FAT32 cannot hold files over 4 GB. Use an output folder on an NTFS or exFAT drive, exactly as the message says.

A job seems to take forever / the Scratch stage looks slow. Normal for temporal restoration (Sections 12, 21). Confirm it is alive: the Elapsed clock ticks, frames climb, the Activity Log gets a line at least every minute. High-resolution Main Pass frames can each take seconds. If the wait is impractical, Cancel, reduce resolution-hungry settings or the enabled tool set, and re-check with Render Preview first.

A job failed. Read the status reason and the Activity Log tail. Disk-space stops name the drive. After fixing the cause, re-run the job — cleanup already happened. A repeatable unexplained failure is worth a crash report / support request with the job's settings.

I cancelled a job — is anything left behind? No. Temporaries are removed on cancel; no partial output is left. Re-run whenever ready.

The program crashed. The crash dialog saved a report locally (Section 24); send it if you are willing. Restart and use **Resume Queue** to continue an interrupted queue.

Preview looks wrong / After pane doesn't show Scratch or Dust results. That is by design for the *static* preview — the temporal tools appear only in **Render Preview** (Section 7.1). Run one; afterwards the After pane shows the exact rendered result at that position.

Scratch or Dust result is too aggressive (detail being eaten). Lower Scratch detection sensitivity / Dust Strength one step at a time, previewing a *detailed clean section* each time. For individual stubborn scratches, prefer Scratch Refinement's Confirm/Mark workflow over raising global sensitivity.

My output isn't where I expected. Check **Output Naming** → output folder (default: `Videos\MSS Media Lab`), and remember **Save as new version** appends `_v2`, `_v3`… Job History (Section 23.1) records every render.

A GPU option is greyed out or refused. The startup capability probe found your GPU lacks that mode (Section 17), or no NVIDIA GPU is present (AI tools flag this in System Check). Use the CPU equivalent or another format.

Dust & Dirt Removal checkbox is disabled. Read the note under the row: either FPS Correction is enabled (mutually exclusive) or the source is interlaced and needs Deinterlace enabled first (Section 13.4).

29. Best Practices

- **Keep your originals.** Always retain the source scan/tape capture untouched. Never overwrite your only original copy — MSS Media Lab defaults to versioning (`_v2`) rather than replacing for this reason.
- **Preview before long renders.** Render Preview on representative sections — damaged *and* clean — before every full render (Section 7.3).
- **Start conservative.** Default Scratch sensitivity (4) and Dust Strength 2 (Conservative) first; escalate only when previews prove the need.
- **Inspect real detail**, not just the defects: grain, textures, deliberate vertical lines, faces. The goal is damage removed *and* picture preserved.
- **Use fast NVMe storage** for the output drive, with generous free space — the preflight's estimates show just how much restoration work moves through the working area.
- **Keep GPU drivers current** for GPU encoding and the AI tools.
- **Master first, deliver second.** Render one lossless/high-quality master (FFV1, ProRes HQ), check it end to end, then produce delivery copies.
- **Save a project** (`.msslabproj`) for any job you may need to revisit — it preserves exact settings for re-renders and customer questions.
- **Use Job History exports** as your paper trail for customer work.

30. Support

- **Product information and purchase:** www.motionscansystems.com/mss-media-lab (also reachable from the trial banner's **Purchase Now** and the Trial Expired window's **Purchase License**).
- **Crash reports** are delivered to Motion Scan Systems (mss@motionscansystems.com) via the built-in reporter (Section 24); each delivery shows a confirmation reference you can quote in support requests.
- When contacting support, include: the program version (**Help → About MSS Media Lab** — Version 2.0.0), what you were doing, the source material's format/resolution/duration, the tools enabled, any message shown verbatim, and your crash-report reference if applicable.

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