STEP-BY-STEP TUTORIAL

SCAN7

Analog animation, explained drawer by drawer

The complete user guide to SCAN7, a software recreation of the Scanimate: from your first title to the A → B programmer, from the hi-con card to the oscillators, from the band colorizer to the re-scan camera, from the three layers to the final export.



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Contents

1 Getting started and a tour of the interface

Launch · three layers, five tabs · transport · knob conventions

2 The source and the hi-con camera

Text · video with In/Out · image and cut-out PNG · camera · patterns and animated shapes · threshold, softness, outline

3 Scan deflection

Geometry · 3D tilts and focal length · cylinder, sphere, twist

4 The oscillators

Three oscillators · fifteen axes · exercise: the flag and the swirl

5 The colorizer and the chrome

12 palettes · level bands · edge fringes · level ramp

6 Phosphor, glow and layer blending

Max / Add / Dissolve persistence · glow · key, add, screen, multiply

7 The output — format, background, re-scan camera

8 The A → B programmer

Store · T-bar · automatic ramp · take over

9 Record, export, save

● REC · Export… · output window · Bypass · presets and My settings

A Appendices

The 28 presets · command line · files on disk · troubleshooting

THE ORIGINAL MACHINE

In the late 1960s, Computer Image Corporation's Scanimate animated black-and-white cards by using an analog computer to deflect the scan of a cathode-ray tube, which a camera then re-shot; a colorizer gave each gray level a color. Its chrome titles and waving logos made the look of 1970s television. This software takes up the complete chain — hi-con, deflection, oscillators, colorizer, persistence, re-scan — on three layers. Throughout the guide, the box points out what comes from the period machine.

1 Getting started and a tour of the interface



Launching the app

Double-click **SCAN7.app**. At first launch, enter your licence key (one online activation, then nothing more). The window opens: sidebar on the left, preview on the right. The “Chrome title” preset is already animating a word in chrome letters over rays.

Three layers

Below the presets, the **Layer A / B / C** buttons. Each layer is a complete Scanimate chain: source, hi-con, deflection, oscillators, color, persistence. The **Source**, **Deflection** and **Color** tabs show *the selected layer*; **Output** and **Motion** are shared.

The five tabs

Tab	Modules
SOURCE	Layer source · Hi-con camera
DEFLECTION	Scan geometry · Wraps · Oscillator 1-3
COLOR	Colorizer · Level ramp (chrome) · Phosphor persistence · Glow · Blend
OUTPUT	Output format · Background · Re-scan camera
MOTION	A → B programmer

The transport bar

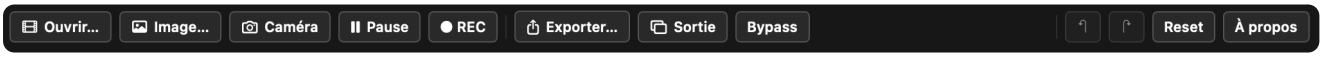


Fig. 1 — Open… (video), Image…, Camera, Play / Pause, ● REC, Export…, Output, Bypass; on the right ↶ ↷, Reset, About.



*Fig. 2 — The master video timeline: position, duration, **[In** and **Out]** points (loop and export range), ✕ to clear the range.*

Knob conventions

Gesture	Effect
Drag the slider	Sets the value continuously.
Double-click the label	Back to the default value.
Click the number	Type it in: `Return` confirms (clamped), `Esc` cancels.
`space` · `⌘Z` / `⇧⌘Z`	Play / pause · undo / redo (complete snapshots).

> 💡 **Reset** = the blank sheet (layer A as white text, B and C off). The 28 **presets** define a *look* and keep your text, your font and your files.

2 The source and the hi-con camera

Layer source — the card in front of the camera

Layer on switches the layer on or off. Six sources:

Source	Settings
Text	The text field (several lines), a system **font**, bold / italic, **Size** (fraction of the height), **Letter spacing**, **Line spacing**, **Outline** (0 = solid letters, otherwise stroke width), Left / Center / Right alignment.
Video	**Open a video…**; loops, [In / Out] points on the timeline. The first video loaded is the *master video* for export.
Image	Logo, card, photo. A **PNG with transparency** is cut out by its alpha (automatic detection, toggle). **Original colors**: deflection, shading, glow and persistence apply, but not the colorizer.
Camera	The live webcam — point it at a real card.
Pattern	Electronic generator: H lines, V lines, Grid, Circles, Rays, Checker, Dots, Ramp, and the animated shapes **Star** (pulses), **Heart** (beats), **Rings** (each at its own level → its own color), **Eye** (blinks, wandering gaze). Knobs: Count, Animation (speed), Angle, Proportion, **Shape size**, **Center X / Y**.

Framing in the output format: *Fit*, *Fill*, *Stretch*.

Hi-con camera — the contrast that does it all

The Scanimate only saw black and white. The **Hi-con camera** module reproduces that regime:



Control	Effect
Threshold	Gray level that separates black from white.
Softness	0 = hard contrast (card); **0.5 = the gradient is kept**: a video keeps its levels and the colorizer colors it smoothly.
Gamma	Level curve before the threshold.
Invert (negative)	White on black ↔ black on white.
Outline + width	Differentiator: only the edges remain — the letters become neon tubes.

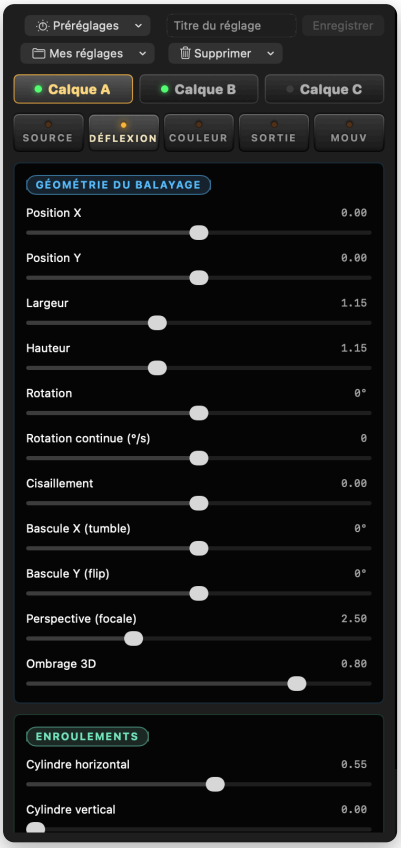
ON THE MACHINE

The “hi-con” (high-contrast, ~945-line) camera shot a card lit perfectly evenly: the cleaner the black and white, the cleaner the deflection and the colorizing. Simple, bold shapes always give the best results.

Exercise — my first title

Reset. Source → **Text**: type your word, bold font, Size 0.3. Watch the hi-con camera: **Outline** 0 → 0.5: the word becomes a neon sign. Back to 0, set **Softness** to 0.5, then open the Color tab: the colorizer bands appear inside the thickness of the letters.

3 Scan deflection



This is the heart of the machine: the picture is not distorted by a filter, it is the *scan* that is deflected — each output pixel goes and fetches the point of the card the beam would have drawn. The **DEFLECTION** tab acts on the selected layer.

Scan geometry

Control	Effect
Position X / Y	Moves the artwork in the frame (deflection included).
Width / Height	Separate scales: the anamorphic squeeze of old title sequences.
Rotation / **Continuous rotation (°/s)**	Fixed angle, or a permanent spin.
Skew	Leans the verticals: electronic italics.
Tilt X (tumble) / **Tilt Y (flip)**	Tilts the plane in true perspective; whatever passes behind the camera is clipped.
Perspective (focal length)	Strength of the tilt perspective (low = wide angle).
3D shading	Darkens toward the horizon: the receding floor.

Wraps

Control	Effect
Horizontal / vertical cylinder	Wraps the picture around a tube lying down or standing up.
Sphere	Bulges into a ball; **negative = pincushion** (hollow).
Twist	Twists around the center.



Fig. 3 — “Perspective crawl” (tilt X, shading), “Sphere” (spherical wrap), “3D checkerboard” (tilted pattern).

Exercise — the receding crawl

A white title. **Tilt X** 55°, **Perspective** 2, **3D shading** 0.6: the text lies on a floor receding into the distance. Oscillator 1 (chap. 4) on **Position Y**, Saw, speed 0.2: it crawls endlessly. **Sphere** 0.3 bulges it like a screen.

ON THE MACHINE

Each distortion was a voltage added to the X and Y scan signals: a ramp to tilt, a sine to wave, a product for perspective. SCAN7 computes the same thing per pixel, at 60 frames per second, on three layers.

4 The oscillators

Three **oscillators** per layer, at the bottom of the Deflection tab. Each produces a periodic signal — **Sine**, **Triangle**, **Saw**, **Square** — and sends it to an **axis**: this is the Scanimate's patch bay.

Control	Effect
Amplitude	Extent of the motion (0 = oscillator off).
Frequency	Number of periods across the picture (spatial axes) or per unit (global axes).
Speed (Hz)	Travel over time; 0 = frozen wave.
Phase	Starting offset, to desynchronize two oscillators.

The fifteen axes

Axis	What moves
H wave (along V)	Each line slides left / right according to its height: the flag.
V wave (along H)	Each column rises and falls: the wave.
H / V accordion	The picture compresses and stretches periodically.
Radial	Ripples spreading from the center.
Swirl	Rotation growing with distance from the center — the nebula.
Rotation · Size · Position X · Position Y	The geometry controls oscillate: swaying, pulsing, back-and-forth.
Tilt X · Tilt Y	The plane tilts back and forth — the endless tumble.
Hue	The colorizer hue oscillates.
Width · Height	Animated anamorphic squeeze.

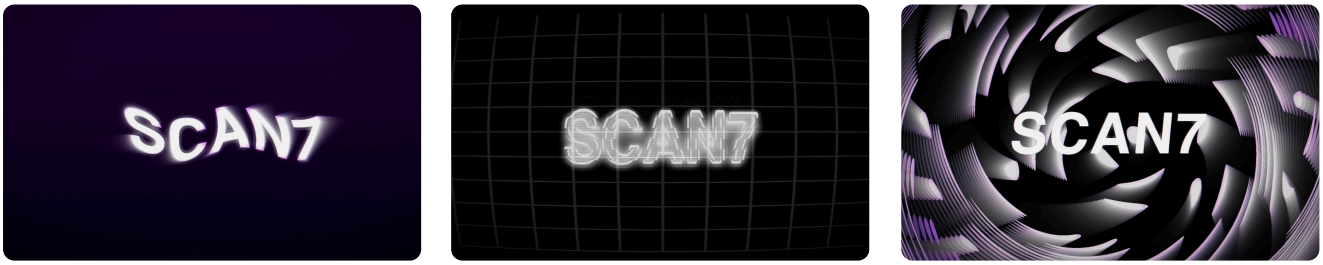


Fig. 4 — “Waving neon” (H wave), “Oscilloscope” (grid pattern + V wave), “Nebula” (Swirl + persistence).

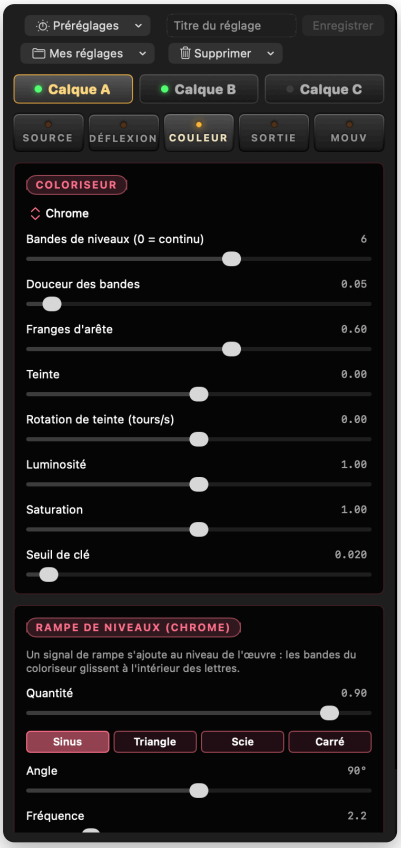
🎛️ **Exercise — the flag, then the swirl**

A title. Oscillator 1: **H wave (along V)**, Sine, Amplitude 0.08, Frequency 2, Speed 0.6: the flag. Oscillator 2: **Size**, Triangle, Amplitude 0.1, Speed 0.3: it breathes. Switch them off (Amplitude 0) and set oscillator 3 to **Swirl**, Amplitude 1.5, Speed 0.1, with a Persistence of 0.9 (chap. 6): the nebula.

💡 **TIP**

A **Saw** on Position X or Y makes an endless crawl; a **Square** on Hue makes the color blink in tempo — that is the “Flickering neon” preset.

5 The colorizer and the chrome



The Scanimate output gray levels; the **colorizer** gave each level a color. The COLOR tab reproduces that stage, per layer.

Colorizer

Control	Effect
Palette	Chrome, Rainbow, Neon, Fire, Ice, Peacock, Phosphor, Sun, Purple, **Mono** (free color), Copper, TV pastel.
Level bands	0 = continuous gradient; 2 to 10 = color steps — the electronic poster.
Band softness	Sharp or blended transition between steps.
Edge fringes	A border of another hue at the band boundaries — the Scanimate signature.
Hue / Hue rotation (turns/s)	Palette offset, fixed or rotating.
Brightness · Saturation	Layer adjustments.
Key threshold	Below this level the layer is transparent (key blending).

Level ramp — the “chrome”

A **ramp** signal (Sine / Triangle / Saw / Square shape, **Angle**, **Frequency**, **Speed**) is *multiplied* into the artwork level according to the **Amount**. The colorizer bands no longer follow the shape of the letters: they slide *through* the letters, at an angle, in motion. This is the chrome effect of every 70s logo.



Fig. 5 — “Chrome title”, “Classic chrome”, “Rainbow bands”: three uses of the level ramp and the bands.

Exercise — the chrome logo

A bold title, hi-con Softness 0.5. Colorizer: **Chrome** palette, Bands 6, Band softness 0.05, Edge fringes 0.5. Level ramp: Amount 0.9, Sine, Angle 90°, Frequency 2.2, Speed 0.3. The reflections flow down through the letters. Switch the palette to **Fire**, then **Ice**: same motion, different material.

ON THE MACHINE

The bands came from quantizing the luminance signal into a few levels, each sent to one color of the colorizer; the “ramp” was an oscillator added to the luminance before quantization.

6 Phosphor, glow and layer blending

Phosphor persistence

The **Phosphor persistence** module feeds the layer's previous frame back in, transformed:

Control	Effect
Decay	Length of the trails (0 = none, 0.95 = very long).
Echo zoom	> 1: each echo grows — tunnel; < 1: it shrinks.
Drift X / Y	The echoes slide: a wake.
Echo rotation	Spiral.
Echo hue	The echoes drift in color: a rainbow of trails.
Mode	**Max** (echoes don't add up: clean), **Add** (bright, beware of saturation), **Dissolve** (soft mix).

Glow

Amount and **Radius**: the bloom of an overexposed tube around the bright areas.

⚠️ Persistence in **Add** + strong glow = runaway to white (the glow re-reads the previous frame, already glowing). Prefer **Max** or **Dissolve**, or lower the Decay.

Blend — stacking the three layers

The **Blend** module sets how the layer sits on those beneath it (A at the bottom, C on top):

Mode	Effect
Key	The layer covers wherever it exceeds its *Key threshold*; transparent elsewhere. The “card on a background” mode.
Add	Lights add up: two neon tubes cross and burn.
Screen	Soft addition, without saturating.
Multiply	The layer tints what lies beneath: a ramp pattern in multiply colors a title.

Opacity scales it all. The **Background** (Output tab) shows beneath the layers.

🎛️ **Exercise — the title on its animated background**

Layer A: **Rays** pattern, Sun palette, Continuous rotation 10 °/s. Layer B: your title, Chrome palette, **Key** blend, Key threshold 0.1. Layer C: **Rings** pattern, **Add** blend, Opacity 0.4, Decay 0.8, Echo zoom 1.03: rings drifting away behind the title.

📼 On the machine, complex pictures were built in several passes layered on videotape, one layer at a time: SCAN7's three layers are those passes, live.

7 The output — format, background, re-scan camera



Output format

The menu sets the size of the final picture, used by the preview, REC and export; sources are framed into it (Fit / Fill / Stretch per layer):

Format	Use
1920 × 1080 · 1280 × 720	16:9 HD, the default
1440 × 1080 · 960 × 720	4:3 in HD — the period frame
720 × 576 (PAL) · 640 × 480 (NTSC)	Standard definition, for a CRT monitor or a “broadcast” capture
1080 × 1080 · 1080 × 1920	Square and vertical, for social networks

Background

Black, **Color** (a free color) or **Gradient** between *Color* and *Color 2*. Visible beneath keyed layers and through opacities.

Re-scan camera — the re-shot monitor

Control	Effect
Tube curvature	Bulge of the CRT screen.
Bandwidth (H smear)	Horizontal transitions smear, like a composite signal.
Chroma aberration	Red and blue offset at the edges.
Softness	Overall optical blur.
Scanlines / Line count	Intensity and number of lines (576 for PAL, 480 for NTSC…).
Phosphor mask	The tube's RGB dot pattern, visible up close.
Noise · Flicker	Video grain and 60 Hz flicker.
Vignette · Gamma · Contrast	Dark corners, final curve and dynamics.

💡 **“Clean signal”** turns the whole re-scan camera off: a crisp render for motion design. **“Station card”** pushes smear, scanlines and noise: the rediscovered VHS tape.





8 The A → B programmer



The Scanimate operator prepared a start state and an end state, then *played the move* by hand. The **MOTION** tab holds that programmer, global to all three layers.

1. Set up the starting picture: sources, deflection, color, on all three layers. **Store A**.
2. Change whatever you like: tilt, size, palette, oscillators… **Store B**.
3. **Recall A** / **Recall B** load a memory back into the knobs, to tweak it and store it again.
4. **Move active** arms the **T-bar**: drag the slider from A to B, every continuous parameter interpolates, discrete values (palette, shape, source) switch at mid-course. An orange banner reminds you that the output follows the memories.
5. **Automatic ramp**: **Ramp duration (s)**, **Once** / **Loop** / **Ping-pong**, **Linear**, **Smooth**, **Accelerate** or **Decelerate** curve; **Start the ramp** plays the T-bar on its own, **Stop the ramp** freezes it.
6. **Take over**: the knobs become masters again, without a frame jump — the output stays exactly where the T-bar left it.

⚠ **THE SLIDERS NO LONGER RESPOND?**

The **Move** is active: the output follows memories A/B, not the knobs. Click **Take over** in the orange banner.

💡 **ON EXPORT**

If the ramp is active, it starts at the beginning of the exported movie: set its duration to that of the movie (suggested duration = ramp duration) for a complete move, or use Ping-pong / Loop for an endless background.

🎛 **Exercise — the logo arrives**

A: tiny title (Size 0.02), Tilt Y 80°, Decay 0.9, Ice palette. B: full-size title (0.3), Tilt Y 0°, Decay 0.2, Chrome palette. Ramp: 3 s, Once, **Decelerate**, **Start the ramp**: the logo flies in spinning on itself and settles. Export 4 s in generative mode.

📼 **ON THE MACHINE**

The Scanimate's “moves” were played by hand on the knobs during recording, sometimes by two operators; the most complex ones were stored in an analog voltage sequencer. Memories A/B and the ramp are that sequencer, with two positions.

9 Record, export, save

● REC — the live performance

● **REC** asks for a .mov file, then records the composed output as you see it — T-bar, knob gestures, camera — at a constant frame rate. ■ **Stop** finalizes the file.

Export… — the frame-by-frame render

The export recomputes every frame offline, losing nothing, with the same engine as the preview: sequential readers per video layer, text rasterized identically, A → B ramp starting from zero. Two exports of the same setting give the same movie.

Situation	Frame rate and duration	Sound
A layer plays a **video** (master video)	Those of the video, **[In** / **Out]** range respected	Original sound copied
No video (**generative** mode)	24 / 25 / 30 / 60 fps, free duration	Silent

Options: **Codec** H.264 (Low / Medium / High) or **ProRes 422 / 4444** for editing. Progress and **Cancel** in the transport.

> 💡 **REC OR EXPORT?**
>
> A performance with a camera or hand-played moves → **REC**. A title for an edit, a studio backdrop, a ProRes render → **Export**, programming the motion with the A → B ramp and the oscillators.

Output window and Bypass

Output opens a window without interface for a second display or an OBS capture; `F` or `^⌘F` makes it full screen. **Bypass** shows the raw master video in the preview (the export stays processed): handy for setting the In/Out points.

Presets and My settings

- The **Presets** menu loads one of the 28 built-in settings (list in the appendix). They define the *look* — deflection, color, oscillators, output — and **keep your text, your font and your files**.
- Type a **Setting title** and **Save**: the complete state — three layers, globals, A/B memories and programmer — becomes a JSON file in `~/Library/Application Support/SCAN7/Presets/`, listed under **My settings** (**Delete** to remove it).
- "· customized" next to the name flags a setting changed since it was loaded; `⌘Z` steps back in time through complete snapshots.

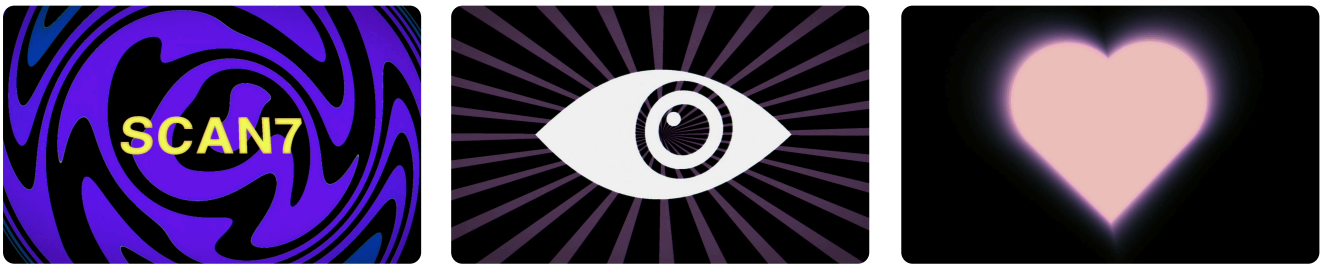


Fig. 8 — Three presets: "Tunnel", "Blinking eye", "Beating heart".

A Appendices

The 28 presets

Family	Presets
Chrome titles	Chrome title · Classic chrome · Rainbow bands · Waving neon · Flickering neon · Electric outline · Burst
Space and perspective	Tunnel · 3D tumble · Sphere · 3D checkerboard · Perspective crawl · Endless tumble · Spinning rays
Textures	Flag · Trails · Nebula · Liquid mirror · Oscilloscope · Twisted ribbon · Line rain
Video	Colorized video · Station card · Clean signal
Animated shapes	Blinking eye · Target · Studio star · Beating heart

Command line

```
SCAN7 --render input.mp4 output.mov [preset]                  # video in layer A, sound copied
SCAN7 --render-gen output.mov [seconds] [preset] [text]        # animated title, 60 fps
SCAN7 --open file.mp4 [preset]                                 # interface with the video loaded
SCAN7 --presets | --licence "<key>" | --machine-id
```

Variables: `SCAN7_LANG=fr` (French interface; English by default, or the selector in About), `MESCALINA_LICENCE` (token for renders without interface). The preset is given by number or by the beginning of its name, without accents.

Files on disk

Content	Location
My settings (JSON: layers, globals, A/B memories, programmer)	`~/Library/Application Support/SCAN7/Presets/`

Troubleshooting

Symptom	Likely cause / fix
The sliders no longer change the picture	**Move active**: the output follows memories A/B. Click “Take over” (chap. 8).
A layer stays black	Layer not **on**, source “None”, Opacity 0, hi-con Threshold too high, or Key threshold above all its levels.
The picture saturates to white	Persistence in **Add** + glow: switch to Max or Dissolve, lower the Decay (chap. 6).
The video has lost its color	Normal: the hi-con camera keeps only the levels; raise **Softness** to 0.5 and pick a palette, or check **Original colors** for an image.
The text is cut off	Size too large for the format: reduce Size or Letter spacing, or switch Framing to Fit.
No sound in the export	Only the master video provides sound; generative mode is silent.
The camera stays black	Permission denied: System Settings → Privacy & Security → Camera.