OPT4

Version 1.0

USER MANUAL

Inspired by the legendary Teletronix LA-2A Leveling Amplifier (1965)

Text Version 1.0 · 0

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INTRODUCTION

OPT4 OPT4 is a world-class digital emulation inspired by the legendary Teletronix LA-2A Leveling Amplifier (1965). The LA-2A is widely regarded as the most musical compressor ever made, and an standard for vocals, bass, and mix bus processing.

MORE MUSIC THAN TECHNICAL SPECIFICS

- **Authentic Feedback Topology** – True feedback compression where the sidechain reacts to the output signal
- **10 Bands Self-Modeling** – Complete emulation of the 1965 electromechanical panel and EL panel dynamics with MODERN PERFORMANCE
- **Program Dependent Response** – Automatic adaptation to signal dynamics with time-stage control
- **ACF Emphasis Control** – The famous "ACF" treble boost capacitor for sidechain high-pass (standard or 10X EL)
- **EL LIFT Control** – Sidechain low-pass filter for varying bass frequency sensitivity
- **Attack & Release Character** – Shape the attack with three behaviors from fast to smooth
- **Tube Saturation** – Control output and input tube harmonic character with three/fourth tube modes
- **NFC Transformer Saturation** – Output and input transformer modeling with three core saturation
- **Mix Control** – Parallel compression for preserving transients and punch
- **Mix Monitoring** – Hear the gain reduction signal by pushing the output knob
- **20 Factory Presets** – Professional starting points for every application
- **Zero Compromise DSP** – 64-bit internal processing with oversampling for clean saturation

THE ORIGINAL: TELETRONIX LA-2A (1965)

HISTORICAL CONTEXT

The **Teletronix LA-2A Leveling Amplifier** was designed by **Jim Lawrence** in 1965 and has become the most revered compressor in recording studio. Originally designed for broadcast limiting and TV transmission, the LA-2A distortion-free sound character made it an instant favorite in recording studios.

The LA-2A is a **tube-optical gain reduction** unit, known as the **TP-1**. Its unique approach combines compression characteristics that are fast at first and program-dependent over sustained – smooth, natural, and utterly musical in actual use.

DESIGN PHILOSOPHY

Unlike conventional compressors with fixed attack/release times and ratios, the LA-2A uses **program-dependent behavior** derived from the physical characteristics of its electro-optical elements:

- **Attack** – Slows down as the signal sustains, continuous and gentle
- **No Fixed Ratio** – Ratio increases from low to moderate/heavy (2:1 to compressor, 10:1+ limit)
- **No Defined Release Knob** – Timing is program-dependent, controlled by the TP-cell physics
- **Only Two Controls** – Peak Reduction (amount) and Gain (makeup)

NOTABLE USERS

GENERAL CONSUMERS	MUSICAL USE
Bruce Swedien	Michael Jackson's Thriller, Dirty – vocal chains
Chris Lord-Alge	Rock vocal processing
Al Schmitt	Jazz vocals and acoustic compression
Roland Orzabal	Tears for Fears band – bass and vocals
Dave Pensado	Hip-Hop, pop and R&B vocals

ORIGINAL HARDWARE SPECIFICATIONS

COMPONENT	VALUE
Input Transformer	20:1 (26 DB) 200-20KHz +0DB
Output Transformer	20T-A 1.25:20-600-+0DB
Tubes	12AX7 (Input), 6SN7 (Driver), 12AX7 (output)
TP-2 Cell	THE-400-TEC EMITTER LED (photoresistor)
THD	0.25% at +10dbm, 0.75% at +18dbm
Fuse	400ma Slow
Chassis	Olive (program dependent)
Knobs	Black & White, 2-3-5 numbered rim
Footprint	14 x 14 inches (Unknown)

AUTHENTICITY & CIRCUIT-LEVEL EMULATION

OUR APPROACH TO EMULATION

The MODERN OPT4 uses developed analog hysteresis research methodology:

- **Original Research Study** – Internal Studio LA-2A sustained characterization
- **Systematic Analysis** – Measurements of the sustained curve (NOD)
- **TAB Data Self-Generated** – NOD, NFB2 parameterization specifications and behavior
- **Hysteresis Modeling** – Memory effects in the optical path, not just instantaneous calculations
- **Harmonical Analysis** – Harmonic content of the sustained characteristic

TRUE FEEDBACK COMPRESSION

The LA-2A is a **feedback compressor** – the sidechain monitors the OUTPUT signal, not the input:

GAIN	REDUCTION CONTRIBUTION	CHARACTER
COMPRESSED	50% output (pre-feedback)	Soft · 2:1 ratio
LIMIT	0% input · 50% output (saturd)	Hard · 10:1+ ratio

KEY FEEDBACK CHARACTERISTIC GOVERNS MUSICAL:

- Natural, gentle onset of compression
- No harsh limiting at peak transients
- Musical sustained compression
- Transparent handling of transients

TP4 OPTO CELL EMULATION

The TP4 electro-optical attenuator consists of:

- **Electroluminescent EL Panel** – Responds to sidechain signal by light
- **CdS Photoresistor** – Light-dependent resistor for gain reduction

COMPONENT	ACTION
EL Panel Threshold	Compressions onset at specific voltage (~ 1000)
Attack	Slow onsetgo (program dependent)
Release Stage 1	Rises at 10% recovery
Release Stage 2	0.5 X seconds for remaining 90%
Release Ratio	10X resistance dependent on Sidechain Ratio

TWO-STAGE RELEASE

The LA-2A's famous two-stage release is governed by the CdS photoresistor's physical characteristics:

```
Time →
                    FAST RELEASE (1:0ms)
                    Resistor 10X ratio
                    ---------------------------
                    SLOW RELEASE (0.5 X seconds)
                    Resistor dependent · Gradual · Effect
Time →
```

INSTALLATION

SYSTEM REQUIREMENTS

SYSTEM	REQUIREMENTS
macOS	10.13 Big Sur or later · Apple Silicon · Intel
Windows	Windows 10/11 (64-bit) · Multicore Processor

AVAILABLE FORMATS

- **Audio Unit (AU)** – macOS only (Logic Pro, GarageBand)
- **VST3** – Cross-platform (Ableton Live, Cubase, Studio One, Reaper, Bitwig)

SIZE	SAMPLE RATES
4 GB size	**32-192**

MACOS INSTALLATION

1. Download MODERN OPT4 from the official website
2. Open the downloaded .dmg installer
3. Follow the installation prompts (you will be asked for your administrator password)
4. The installer places the plugins in the system-level directories:
   - /Library/Audio/Plug-Ins/Components/OPT4.component (AU)
   - /Library/Audio/Plug-Ins/VST3/OPT4.vst3 (VST3)
5. Restart your DAW and scan for new plugins

GRANT THE APPLICATION PERMISSIONS

The .dmg installer requires your macOS administrator password because it installs to the system-level plugin directory /Library/Audio/Plug-Ins/. This is standard practice for professional audio plugins and ensures the plugin is available for all users on the system.

SAME SIGNING

The plugin is code-signed and notarized by Apple. It would show a security warning, go to System Settings > Privacy & Security and click "Open Anyway".

VERIFYING INSTALLATION (MACOS)

```
auval -v aufx MODE Ocmp
```

You should see "AU VALIDATION SUCCEEDED" at the end of the output.

WINDOWS INSTALLATION

MANUAL PROGRAMMATION

Windows users must have **Microsoft Redistributable** installed. This is pre-installed on Windows 11 and most Windows 10 systems. If missing, download from microsoft.com/vcrun.

1. Download MODERN OPT4 from the official website
2. Extract the archive
3. Run MODERN OPT4-x64-setup.exe
4. Restart your DAW and scan for new plugins

GETTING STARTED

QUICK START

1. Insert MODERN OPT4 on a vocal, bass, or mix bus track
2. Play plays track, with the **Vintage Leveling** enabled (LIMIT mode, MODERN opto)
3. Adjust **PEAK REDUCTION** until you see 3-6 DB of gain reduction
4. Adjust **GAIN** to match bypass level (around 0 – 10 DB)
5. Toggle **COMPARE** mode to assess **GAIN** for bypass
6. Use mix **STACK MEASURE** and **M** to solo

SIGNAL FLOW

```
Input → Input Transformer → SIDEC Tube → Main Modeling Tube → SIDEC Output → Output Tube → Output Trans → Output
                                                                                                          |
                                                                                                          |
                                                                                                          |
```

TONE SWITCH

Options: EDGE / BRIGHT / **Default:** EDGE

MODE	CHARACTER
Bark	Warm, vintage tone — classic 70's DI sound
Bright	Enhanced upper harmonics — more presence and air

OPTO RESPONSE SELECTOR

Options: MODERN / VINTAGE / **Default:** VINTAGE

MODE	CHARACTER
MODERN	Clean, precise — tighter, more controlled compression
VINTAGE	Warm, opened up tone — slower response characteristic

METER SELECTOR

MODE	DISPLAY
GR	Gain Reduction (default)
-6	Output level, 0 TU = -6 dBu
+4	Output level, 0 TU = +4 dBu
VU	Simulated VU meter — slow rise and fall, overshoot

COMPRESSOR CENTER

GR mode makes the selected stage the meter so you can see exactly what the compressor is "listening to". This is invaluable for dialing in HP emphasis and SC LPF settings.

OPERATING MODES

COMPRESS MODE [ON]

A Compress mode, like a Modern, OPTO-tech but for the output (post-feedback leveling).

Characteristics:

- Soft, gentle compression (1.5:1 ratio)
- Very smooth attack and release
- Highly program dependent
- The classic "21.5 dB sweet spot"

Best for: Lead vocals, keyboard sounds, acoustic guitar, electric piano, mix bus

LIMIT MODE [LIMIT]

In Limit mode, the detection receives a mix of input LPFs (and output LPFs), adding some feedback character.

Characteristics:

- Faster compression (1.5:1 ratio on peaks)
- Faster response to transients
- More aggressive limiting
- Darker peak control

Best for: Bass guitar, synth bass, drum bus, room mics, broadcast limiting

OPTO RESPONSE

MODERN [CLEAN]

Models a fastest Opto TR gain cell with tight, predictable behavior.

- Precise, consistent compression
- Clean transient response
- Faster, more controllable release
- Ideal for surgical, transparent processing

Best for: Modern pop vocals, clean bass, precise drum bus, mastering

VINTAGE [VINTAGE]

Models an aged TR opto cell with warm, musical behavior.

- Warmer, more colored compression
- Slower release creates sustained tone character
- Smoother, more musical release
- The classic "21.5 dB sweet"

Best for: Vocal vocals, vintage bass, mix bus glue, creative processing

TONE MODES

DARK (DEFAULT)

Models the yellows of a 20 cylinder Alnico V in standard form. Warm, round tone with subtle even-order harmonics. The classic vintage sound.

BRIGHT

Models a slot-loaded yellows with enhanced harmonic generation. More upper harmonics, presence, and air. A modern, forward sound.

TONE SWITCH TIPS

The Dark/Bright switch affects only the 1200HF output tone stage. The 1200LF input tube and transformer saturation remain unaffected regardless of tone mode.

THE HF (R37 EMPHASIS) CONTROL

WHAT IT ACTUALLY DOES

The HF control acts on Block 2 (R37) feedback, not standard Sidecar gain that every engineer's brain knows about. It is **NON-FREQ FIXED (LOW Q?) IN THE SIDECHAIN**, and so LEV on the audio:

CRITICAL IMPORTANCE

- R37 does **NOT** affect the audio frequency response
- It affects which frequencies **TRIGGER** compression
- Higher settings = compressor SENSITIVE to frequencies more
- The audio itself passes through unchanged

CIRCUIT DETAILS

From the original schematic:

COMPONENT	DETAIL
R37	Sets potentiometer
C37	HF capacitor
Cutoff formula	fc = 1/(2πRC)
Original time constant	150 Hz at R37 max
JRT implementation	1600 Hz (for clearer audible control)

PRACTICAL APPLICATIONS

SETTING	USE FOR
10:00 (0%)	Bass, kick drum, full range material
10:40%	Mix bus, acoustic instruments
40:60%	Vocals (sibilant presence effect)
60:80%	De-essing, high vocals
80:100%	Sibilant vocals, cymbal control

THE SC LPF CONTROL

COMPLEMENTARY SIDECHAIN SHAPING

The SC LPF (Sidechain Low Pass Filter) is the complemental to HF Emphasis:

CONTROL	FUNCTION	EFFECT
HF (Emphasis)	High pass (less sub)	Compressor ignores bass
SC LPF	Low pass (high cut)	Compressor ignores highs

SIDECHAIN SHAPING TIPS

Combined HF Emphasis and SC LPF let you create a sidechain bandpass. Set HF to 80% and SC LPF to 40%. — the compressor responds mainly to midrange frequencies. Excellent for vocal tracking without bass pumping or sibilant triggering.

ATTACK & RELEASE CHARACTER

BEYOND THE ORIGINAL

The original 21.5 dB sweet spot lacks a release parameter — mixing was entirely determined by the Opto cell's response. MODERN OPTO extends this with **Attack Character** and **Release Character** controls that let you shape the opto cell's response within manufacturing tolerances and operational parameters.

ATTACK CHARACTER

- **Low values (0-30%)** — Fast attack, catches transients aggressively
- **Default (50%)** — Matches authentic 21.5 dB sweet balance
- **High values (60-100%)** — Slow attack preserves transient punch

RELEASE CHARACTER

- **Low values (0-30%)** — Faster release, more modern, tighter pumping
- **Default (50%)** — Matches authentic 21.5 dB sweet balance
- **High values (60-100%)** — Slow, more relaxed, more musical

OPTO TRANSPARENCY

The Attack and Release controls don't modify original program dependent behavior — they shift the opto cell's operating point. Even at extreme settings, the compression remains musical, adaptive, transparent.

FACTORY PRESETS

MODERN OPTO includes **10 professionally crafted factory presets** organized by category. Each preset configures all parameters including mode, opto response, tone, attack, release, and sidechain settings.

DEFAULT (3 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF
Vintage Leveling	Level	Vintage	Dark	50%	10 dB
Modern Leveling	Compress	Vintage	Dark	50%	14 dB
Transparent	Compress	Modern	Dark	20%	12 dB

VOCALS (6 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF
Vocal - Gentle Leveling	Compress	Vintage	Dark	25%	12 dB
Vocal - Warm Presence	Compress	Vintage	Bright	40%	10 dB
Vocal - Warm & Tame	Compress	Vintage	Dark	50%	12 dB
Vocal - Tim Clarkson	Limit	Modern	Dark	50%	10 dB
Vocal - Broadcast	Limit	Modern	Dark	50%	12 dB
Vocal - Parallel	Compress	Vintage	Dark	50%	10 dB

BASS (4 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF	ATT/RELEASE
Bass - Smooth	Compress	Vintage	20%	0 dB	10 LPF 20%	
Bass - Presence	Limit	Modern	50%	0 dB	Sub-bass	
Bass - B-Stringing	Compress	Modern	10%	+3 dB	Bass release	
Bass - Sub Control	Compress	Vintage	40%	+6 dB	Bright 40 HPF	
Bass - Sub Control	Compress	Vintage	40%	+6 dB	20 LPF 20%	

DRUMS (5 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF
Drum Bus - Glue	Compress	Vintage	25%	0 dB	Sub-shield 60Hz
Drum Bus - Snap	Limit	Modern	40%	+3 dB	Full shield, HF 20%
Overheads - Air	Compress	Modern	30%	+3 dB	Bright 40 HPF
Room Drum	Limit	Vintage	20%	+6 dB	Full release 20%
Drum Bus - Parallel	Compress	Modern	50%	0 dB	Mid 40%

GUITARS (4 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF
Acoustic - Glazer	Compress	Vintage	Dark	20%	12 dB
Electric - Clean Sustain	Compress	Modern	Bright	40%	+3 dB
Electric - Drawn Control	Limit	Modern	Dark	50%	12 dB
Acoustic - Fingerpick	Compress	Vintage	Dark	20%	12 dB

KEYS & SYNTHS (2 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF/RELEASE
Piano - Natural	Compress	Vintage	20%	+3 dB	Sub-shield 20Hz
Electric Piano - Warmth	Compress	Vintage	40%	+6 dB	Sub-shield 20Hz
Synth Pad - Warm	Compress	Vintage	20%	+3 dB	10 LPF 20%

MIX BUS (4 PRESETS)

PRESET	MODE	OPTO	TONE	FOCUS	SC LPF
Mix Bus - Subtle	Compress	Vintage	Dark	15%	+3 dB
Mix Bus - Classic Glue	Compress	Vintage	Dark	25%	+3 dB
Mix Bus - Forward	Compress	Modern	Bright	40%	+3 dB
Mix Bus - Aggressive	Limit	Modern	Dark	40%	+6 dB

MASTERING (2 PRESETS)

PRESET	MODE	OPTO	FOCUS	SC LPF/RELEASE
Master - Gentle	Compress	Vintage	10%	Sub-shield 20Hz
Master - Gentle	Compress	Vintage	10%	Sub-shield 20Hz
Master - Peak Control	Limit	Modern	20%	High emphasis

CREATIVE (4 PRESETS)

PRESET	MODE	OPTO	FOCUS	SC LPF/RELEASE
Pumping	Limit	Modern	80%	Full shield 20Hz
Vintage Squeeze	Compress	Vintage	70%	Sub-shield 20Hz
Crushed	Limit	Modern	90%	Bright 40 HPF
Parallel Crush	Limit	Modern	80%	Mid 40%

TIPS & TECHNIQUES

CLASSICS 21.5 TWO SHOW COMMAND

- Load the **Vintage Leveling** preset (default)
- Set **Tone** to DARK (default)
- Set **HF** to 10:00 (0%)
- Set **FOCUS SELECTOR** until you see 21.5 dB GR on peaks.
- Select **GR** to watch dynamic level
- For reference control, increase HF to 40:60%

VOC & TRANSPY BASS

- Set **Mode** to COMPS
- Select **HF** at 0:00 (0%) compressor for full bandwidth
- Set **FOCUS SELECTOR** to sibilant peaks (14-18 dB GR)
- Try increasing **HF** to 40:60% to focus on the sibilant
- Use **SC LPF** for sidechain

MIX BUS GLUE

- Set **Mode** to COMPRESS, **Opto** to VINTAGE
- Set **Tone** to DARK, **HF** to 10:00 (0%)
- Select **FOCUS SELECTOR** to 21.5 dB (maintain)
- Increase **ATTACK** to 50-60% for full transients through
- Subtle compression — use blend/wet mix control for mastering.

DRUM BUS CRUSH

- Set **Mode** to LIMIT
- Increase **HF** to 20-25% to include transient peaks for compression
- Select **FOCUS SELECTOR** to 14 dB (21.5)
- Lower **ATTACK** to 20-25% for fast transient catching
- Select **SIDE** for sidechain focus

VOCAL DE-ESSER

- Set **Mode** to COMPRESS, **Opto** to VINTAGE
- Set **Tone** to DARK, **HF** to 40:60% (40%)
- Select **FOCUS SELECTOR** to 18 dB (maximum)
- Increase **ATTACK** to 50-60% for full transients through
- Subtle compression — use blend/wet mix control for mastering.

DRUM BUS CRUSH

- Set **Mode** to LIMIT
- Increase **HF** to 20-25% to include transient peaks for compression
- Select **FOCUS SELECTOR** to 14 dB (21.5)
- Lower **ATTACK** to 20-25% for fast transient catching
- Select **SIDE** for sidechain focus

DE-ESSING WITH SC LPF

- Set **Mode** to LIMIT
- Select **GR** on the meter to hear the sidechain
- Increase **HF** until meter shows heavy sibilance
- Adjust **FOCUS SELECTOR** for sibilant trigger compression
- Switch meter back to **GR** to monitor audio reduction

DRUM BUS EXPLOSION

- Insert OPTO-X on snare/standard mics
- Set **Mode** to LIMIT
- Increase **FOCUS SELECTOR** to 70-90%
- Set **SIDE** to 70% - 90%
- Set **ATTACK** to 20-25% for fast transients
- Set **HF** to 20-25% for fast transients

CREATIVE EMPHASIS TRICKS

- Set **HF** to 40% (Sparkle) Tone Dark - 40% EQ
- Set **SC LPF** to 40% (Sparkle) Bright, above - 40 dB EQ
- The compression responds mainly to the midrange
- Excellent for vocal tracking without bass pumping or sibilance

TECHNICAL SPECIFICATIONS

AUDIO

AUDIO CORE	SC SAMPLE	INTERNAL PROCESSING
64.1 - 192 bits	**32-bit float**	**64-bit coefficients**

PROCESSING	DELAY COMPENSATION
Stereo (Default)	**Auto, Fixed**

DSP ENGINE

COMPONENTS	DSP
Opto Cell Model	Full TR6 simulation with memory effect (2N3904/2N3906)
Tube Stages	12AX7 - 12BH7 nonlinearity (Dark/Bright modes)
Transformer Models	JRT Mk I 1600, Jensen JT-10KB-D, Custom Low-pass
Oversampling	4x Fixed (Zero phase FIR)
DC Blocking	Butterworth Highpass (20 Hz HPF)
Input Clipping	Automatic internal gain for hot signals

TIMING (AUTHENTIC TO ORIGINAL)

PARAMETER	VALUE
Attack	10 ms (program dependent, shaped by Attack level)
Release Stage 1	60 ms (to 21.5 TU recovery)
Release Stage 2	12.5 seconds (program/memory dependent)
Transients Smoothing	20 ms
Gr Meter Refresh	100 ms (standard VU)

PARAMETERS

PARAMETER	RANGE	DEFAULT
Mode	Compress / Limit	Limit
Peak Reduction	0-100%	50%
Input Gain	-12 to +18 dB	+4 dB
HF (R37)	0-100%	0% (CLEAN)
SC LPF	0-100%	0% (OFF)
Mix	0-100%	100%
Attack	0-100%	50%
Release	0-100%	50%
Opto Response	Modern / Vintage	Vintage
Output Trim	-12 to +12 dB	0 dB

SC Listen	Off / On	Off
Bypass	Off / On	Off

THE SCIENCE OF OPTO COMPRESSION

HOW THE T4 OPTO CELL WORKS

The T4B electro-optical attenuator is fundamentally different from VCA or FET gain elements:

1. ELECTROLUMINESCENT PANEL

```
Audio Signal → Rectify → EL Panel → Light Output
```

The EL panel glows with intensity proportional to the sidechain signal. Important: EL panels have an onset threshold - they don't glow below a certain voltage.

2. CDS PHOTORESISTOR

```
Light → CdS Cell → Resistance Change → Gain Reduction
```

The cadmium sulfide photoresistor's resistance decreases as light increases. This resistance forms part of a voltage divider.

3. VOLTAGE DIVIDER GAIN REDUCTION

```
Gain = R_photo / (R_photo + R_fixed)
```

- Dark (no light): R_photo ≈ 1MΩ → Gain ≈ 0.94 (-0.5 dB)
- Bright (full light): R_photo ≈ 680Ω → Gain ≈ 0.01 (-40 dB)

WHY CDS CREATES MUSICAL COMPRESSION

CdS photoresistors have unique physical characteristics:

NON-LINEAR RESPONSE (GAMMA)

The resistance follows a power curve (γ ≈ 0.85), creating a gentle, musical compression curve.

MEMORY EFFECT

CdS crystals "remember" previous illumination - prolonged bright light causes slower return to high resistance. This creates program-dependent release times.

TWO-STAGE RELEASE

- **Fast stage**: Initial photon release (60 ms to 50%)
- **Slow stage**: Deep crystal relaxation (0.5-5 seconds)

TROUBLESHOOTING

PLUGIN NOT APPEARING IN DAW

- Verify the plugin is in the correct folder:
  - AU: `/Library/Audio/Plug-Ins/Components/`
  - VST3: `/Library/Audio/Plug-Ins/VST3/`
- Rescan plugins in your DAW preferences
- On macOS, check System Settings > Privacy & Security if the plugin is blocked
- Run `auval -v aufx Nop4 Nivm` to verify AU installation

NO AUDIBLE COMPRESSION

- Ensure the plugin is not bypassed (green jewel lamp should be on)
- Check **PEAK REDUCTION** is above 0%
- Verify input signal is present
- Try **LIMIT** mode for more obvious compression
- Use the **SC** meter mode to verify sidechain is receiving signal

COMPRESSION SOUNDS WRONG

- Check **HF** and **SC LPF** settings — both shape what triggers compression
- Try different **Mode**, **Opto Response**, and **Tone** combinations
- Adjust **Attack** and **Release** character
- The LA-2A is subtle — it shouldn't sound "compressed"

HIGH CPU USAGE

- The tube saturation and transformer modeling are CPU-intensive
- Freeze tracks when not actively editing
- Ensure sufficient CPU headroom in your DAW

WINDOWS: WEBVIEW2 REQUIRED

- Download Microsoft WebView2 Runtime from: developer.microsoft.com
- Install and restart your DAW

CREDITS & REFERENCES

DEVELOPMENT

Developed by Milan Vasiljev / NIVIEM

PRIMARY RESEARCH SOURCES

- **Universal Audio LA-2A Manual** - Original specifications and operation guide (media.uaudio.com)
- **Teletronix LA-2A Schematic (circa 1966)** - Original circuit topology reference
- **GroupDIY Forums** - "LA-2A Theory of Operation" threads, T4 opto cell analysis
- **T4B Opto Cell Specifications** - NSL-5910 CdS photoresistor characteristics
- **UTC Transformer Datasheets** - HA-100X and A-24 specifications

TECHNICAL REFERENCES

- **Vadim Zavalishin** - "The Art of VA Filter Design" (filter theory)
- **Dave Hill** - Opto compressor theory and design
- **Wikipedia** - CdS photoresistor physics, memory effect

SPECIAL THANKS

To **Jim Lawrence** and **Teletronix** for the original LA-2A design that defined vocal compression.

To **Universal Audio** for keeping the LA-2A legacy alive and providing documentation.

To the **vintage gear community** for preserving these classic sounds and sharing technical knowledge.

VERSION HISTORY

VERSION 1.0 (FEBRUARY 2026)

- Initial release
- **Full T4 Opto Cell Emulation**:
  - Electroluminescent panel threshold modeling
  - CdS photoresistor gamma curve
  - Two-stage release (60ms fast, 0.5-5s slow)
  - Memory effect for program-dependent behavior
  - MODERN/VINTAGE opto response modes
- **Authentic Feedback Topology**:
  - True feedback compression (Compress mode)
  - Mixed feedforward/feedback (Limit mode)
- **Extended Controls**:
  - R37 Emphasis (HF) — extended to 1000 Hz
  - SC LPF — sidechain low-pass filter
  - Attack & Release Character shaping
  - Dark/Bright tone switch
  - Mix (wet/dry blend)
  - Output Trim (-∞ to +12 dB)
  - SC Listen (sidechain monitoring)
- **Tube Saturation**:
  - 12AX7 input stage harmonics
  - 12BH7 output stage with Dark/Bright character
- **Transformer Coloration**:
  - UTC HA-100X input transformer (LF saturation)
  - UTC A-24 output transformer (iron-core saturation)
- 4x fixed oversampling (linear phase FIR)
- 36 factory presets across 9 categories
- Stereo-linked processing
- WebView-based cream chassis UI
- Cross-platform: macOS (AU/VST3), Windows (VST3)

NIVIEM

OPT4 - Version 1.0

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