NIVIEM

PHASE ONE

USER MANUAL

Inspired by the legendary Maestro PS-1A Phase Shifter (1971)

Version 1.1

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INTRODUCTION

NIVIEM Phase One is a detailed digital emulation inspired by the legendary Maestro PS-1A Phase Shifter (1971), designed by Tom Oberheim and manufactured by Gibson/Maestro. The PS-1A was one of the first commercially available phaser pedals and became a defining sound of 1970s music.

WHAT MAKES THIS PLUGIN SPECIAL

- **Authentic to the Core** - Vintage Mode uses the exact same DSP code as the original PS-1A - no shortcuts, no compromises
- **True 6-Stage All-Pass Cascade** - Creates 3 sweeping notches for rich, complex phasing
- **Three Speed Presets** - Slow (0.5 Hz), Medium (1.0 Hz), and Fast (6.0 Hz) - matching the original
- **Leslie-Style Speed Ramping** - Smooth acceleration and deceleration when switching speeds
- **Vintage Mode** - Locks to 100% authentic PS-1A behavior with no modern additions
- **Modern Mode** - Adds Depth control and Tempo Sync while preserving the classic sound
- **Zero-Latency Processing** - Real-time performance with no perceptible delay
- **Premium DSP Quality** - 64-bit coefficient calculations, DC blocking, denormal prevention
- **Authentic WebView UI** - Period-accurate interface inspired by 1970s Lowrey organ buttons

THE ORIGINAL: MAESTRO PS-1A (1971)

HISTORICAL CONTEXT

The Maestro PS-1 Phase Shifter was born from **Tom Oberheim's** desire to electronically simulate the sound of a Leslie rotating speaker cabinet. While the Leslie creates its distinctive sound through physical rotation of horn and drum assemblies, Oberheim realized he could approximate this effect using phase-shifting circuits.

The PS-1 debuted in 1971, with the refined PS-1A appearing in early 1972. It quickly became a studio staple and can be heard on countless classic recordings.

DESIGN PHILOSOPHY

Tom Oberheim chose a **6-stage all-pass filter** topology because it creates **3 notches** in the frequency spectrum - enough for a rich, complex phasing effect without becoming muddy or metallic. The three preset speeds were carefully chosen to provide musically useful rates:

- **Slow** - A gentle, breathing 2-second sweep
- **Medium** - The classic 1-second phaser pulse
- **Fast** - A vibrato-like warble effect

The **Leslie-style speed ramping** was a stroke of genius - instead of jarring instant speed changes, the LFO smoothly accelerates or decelerates, just like a real rotating speaker taking time to speed up or slow down.

NOTABLE USERS

ARTIST	NOTABLE USE
John Paul Jones (Led Zeppelin)	The ethereal keyboards on "No Quarter"
George Harrison (The Beatles)	"This Guitar (Can't Keep From Crying)"
Ernie Isley (Isley Brothers)	The iconic phased guitar on "That Lady" (1973)
Steve Howe (Yes)	Progressive rock guitar textures
Alex Lifeson (Rush)	Phased rhythm guitar tones

ORIGINAL HARDWARE SPECIFICATIONS

COMPONENT	VALUE
Power Supply	±15V dual rail
Op-Amps	1458 dual (4 ICs = 8 sections)
JFETs	2N4302 or 2N4303 (matched set of 6)
Speed Buttons	Lowrey organ style rockers
Button Colors	Blue / Yellow / Red
Input/Output	Mono
Designer	Tom Oberheim

AUTHENTICITY & CIRCUIT-LEVEL EMULATION

OUR APPROACH TO EMULATION

The NIVIEM Phase One was developed using rigorous methodology:

1. **Primary Source Analysis** - R.G. Keen's traced schematic and technical documentation
2. **Reference Verification** - Cross-referenced with Patchstorage PS-1A emulation values
3. **Component Verification** - Period-correct JFET characteristics, op-amp topology
4. **Circuit Topology Preservation** - Signal flow matches the original exactly
5. **Behavioral Accuracy** - Each circuit block analyzed and implemented accordingly

6-STAGE ALL-PASS FILTER CASCADE

The original PS-1A uses **6 cascaded first-order all-pass filters**:

PARAMETER	VALUE
Filter Stages	6 (creates 3 notches)
Transfer Function	$H(z) = (a_1 + z^{-1}) / (1 + a_1 z^{-1})$
Coefficient Formula	$a_1 = (\tan(\pi \cdot fb/fs) - 1) / (\tan(\pi \cdot fb/fs) + 1)$
Break Freq Range	20 Hz - 5000 Hz (logarithmic sweep)

> **WHY 6 STAGES?**
>
> - Total DC phase shift: 6 × 180° = 1080° = 3 × 360°
> - Number of notches: 6 ÷ 2 = **3 notches**
> - Rich, complex interference patterns
> - Not too many stages (which can sound metallic)

TRIANGLE WAVE LFO

The PS-1A uses a **triangle wave** LFO rather than a sine wave:

CHARACTERISTIC	REASON
Linear Sweep	Notches move at constant speed

Symmetric	Equal time ascending and descending
No Discontinuities	Smooth transitions at peaks and troughs

LESLIE-STYLE SPEED RAMPING

When switching speeds, the LFO doesn't instantly jump to the new rate:

PARAMETER	VALUE
Ramp Time Constant	0.5 seconds (τ)
Behavior	Exponential smoothing
Full Transition	~1.5 seconds to reach 95%

This creates the same expressive quality as a Leslie speaker's horn speeding up or slowing down.

INSTALLATION

SYSTEM REQUIREMENTS

PLATFORM	REQUIREMENTS
macOS	10.13 (High Sierra) or later, Intel or Apple Silicon
Windows	Windows 10/11 (64-bit), WebView2 Runtime

AVAILABLE FORMATS

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

RAM
4 GB min

DISK SPACE
~30 MB

MACOS INSTALLATION

1. Download NIVIEM Phase One from the official website
2. Extract the archive
3. Copy the plugins to:
   - `~/Library/Audio/Plug-Ins/Components/Niviem Phase One.component` (AU)
   - `~/Library/Audio/Plug-Ins/VST3/Niviem Phase One.vst3` (VST3)
4. Restart your DAW and scan for new plugins

> **CODE SIGNING**
> The plugin is code-signed and notarized by Apple. If macOS shows a security warning, go to System Settings > Privacy & Security and click "Open Anyway".

MANUAL INSTALLATION (TERMINAL)

```
# Copy AU plugin
cp -r "Niviem Phase One.component" ~/Library/Audio/Plug-Ins/Components/

# Copy VST3 plugin
cp -r "Niviem Phase One.vst3" ~/Library/Audio/Plug-Ins/VST3/
```

VERIFYING INSTALLATION (MACOS)

```
auval -v aufx Nps1 Nivm
```

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

WINDOWS INSTALLATION

> **WEBVIEW2 PREREQUISITE**
> Windows users must have **Microsoft WebView2 Runtime** installed. This is pre-installed on Windows 11 and most Windows 10 systems. If needed, download from: developer.microsoft.com

1. Download NIVIEM Phase One from the official website
2. Extract the archive
3. Copy `Niviem Phase One.vst3` to: `C:\Program Files\Common Files\VST3\`
4. Restart your DAW and scan for new plugins

Note: Windows may show a SmartScreen warning for unsigned software. Click "More info" → "Run anyway" to proceed.

GETTING STARTED

QUICK START

1. Insert NIVIEM Phase One on an audio track (guitar, keyboards, synths, vocals, etc.)
2. Click one of the three speed buttons: **SLOW**, **MEDIUM**, or **FAST**
3. That's it! The authentic PS-1A phaser sound is now applied to your audio.

SIGNAL FLOW

```
Input Signal ──► 6-Stage All-Pass Cascade ──► Mix with Dry ──► DC Blocking ──► Output
                                                  ▲
                                                  │
                                            Triangle LFO
                                          (Speed Ramping)
```

The plugin processes your audio through six cascaded first-order all-pass filters. The break frequency of these filters is modulated by a triangle wave LFO, creating the characteristic sweeping effect. The processed (wet) signal is mixed with the dry signal based on the Depth control.

USER INTERFACE OVERVIEW

The NIVIEM Phase One interface features a dark industrial chassis with backlit controls and period-accurate Lowrey-style speed buttons.

VISUAL ELEMENTS

- **LFO Dot** - Animated indicator showing LFO position
  - 🔵 **Blue** when Slow is selected
  - 🟡 **Yellow** when Medium is selected
  - 🔴 **Red** when Fast is selected
- **Speed Buttons** - Backlit glow when active
- **Depth Tooltip** - Shows exact value (0-100%) on hover
- **Bypass LED** - Illuminates when effect is active

OPERATING MODES

NIVIEM Phase One offers two operating modes to suit different workflows:

VINTAGE MODE (AUTHENTIC) AUTHENTIC

When **Vintage Mode** is enabled:

FEATURE	BEHAVIOR
Depth	Locked to 100% (1:1 dry/wet mix)
Tempo Sync	Disabled
Processing	**Byte-for-byte identical** to original PS-1A
Parameter Smoothing	None (authentic)
Bypass	Instant pass-through

Use Vintage Mode when:

- You want 100% authentic PS-1A sound
- You're recreating classic recordings
- You need mono compatibility (no phase issues when summed)

MODERN MODE (ENHANCED)

When **Vintage Mode** is disabled:

FEATURE	BEHAVIOR
Depth	Adjustable 0-100%
Tempo Sync	Available (locks LFO to DAW tempo)
Processing	Enhanced with parameter smoothing
Parameter Smoothing	20ms for click-free changes
Bypass	Crossfade for smooth transitions

Use Modern Mode when:

- You need more subtle phasing (lower Depth)
- You want tempo-locked LFO for rhythmic effects
- You need smooth parameter automation

CONTROLS REFERENCE

SPEED BUTTONS

BUTTON	COLOR	LFO RATE	CYCLE TIME	CHARACTER
SLOW	Blue	0.5 Hz	~2 seconds	Gentle, breathing sweep
MEDIUM	Yellow	1.0 Hz	1 second	Classic phaser pulse
FAST	Red	6.0 Hz	~166ms	Vibrato-like warble

Click any button to select that speed. The LFO will **ramp** to the new speed (Leslie-style).

DEPTH KNOB (MODERN MODE ONLY)

Range: 0% - 100% | **Default:** 100%

Controls the wet/dry mix of the phaser effect.

DEPTH	RESULT
0%	Dry signal only (no phasing)
50%	Subtle phasing, prominent dry
100%	Full phasing (authentic PS-1A)

Note: In Vintage Mode, Depth is locked to 100%.

SYNC TOGGLE (MODERN MODE ONLY)

Options: Off (Free) / On (Tempo) | **Default:** Off

When enabled, the LFO rate locks to your DAW's tempo. The note value the cycle is anchored to is selected with the **DIVISION** chip immediately below the SYNC chip.

Note: In Vintage Mode, Sync is disabled.

DIVISION CHIP (MODERN MODE, TEMPO SYNC ONLY)

Default: 1/4 (one full LFO cycle per beat)

Click the DIVISION chip to open the Tempo Division picker — a categorised modal listing 15 musical note values from very fast pulses through ultra-slow drift:

GROUP	DIVISIONS
FAST	1/32, 1/16T, 1/16, 1/8T, 1/8
MEDIUM	1/8., 1/4T, 1/4, 1/4., 1/2T
SLOW	1/2, 1/2., 1/1, 2/1, 4/1

Triplet figures (`T`) divide a beat into three rather than two; dotted figures (`.`) extend the duration by 50 %. The DIVISION chip is dimmed and inactive when Sync is OFF or Vintage Mode is ON.

RATE KNOB (MODERN MODE, FREE ONLY)

Range: 0.05 Hz to 12 Hz | **Default:** 0.5 Hz (matches the Slow rocker preset)

A continuous LFO rate dial that complements the three Speed rockers. Use the rockers to snap to the authentic preset speeds, then fine-tune with the knob — or drag the knob freely to anywhere in between.

RATE POSITION	RATE (APPROX.)	CHARACTER
Lower travel	0.05 – 1 Hz	Slow drift to gentle pulse
Middle	1 – 3 Hz	Classic phaser pulse and faster
Upper travel	3 – 12 Hz	Vibrato and tremolo territory

The knob is dimmed and inactive in Vintage Mode (which uses the authentic preset table) and in Tempo Sync (where the rate is locked to host BPM via Division). Clicking a rocker snaps the knob to that rocker's preset Hz; dragging the knob away from a preset clears the rocker active highlight, so the lit rocker always represents the currently sounding rate.

STEREO SPREAD KNOB (MODERN MODE ONLY)

Range: 0% to 100% | **Default:** 0% (mono compatible)

Offsets the LFO phase between the left and right channels. At 0 % both channels share the same LFO and the output folds cleanly to mono — exactly the behaviour of the original PS-1A. As the value rises, the right channel's LFO is shifted further out of phase from the left, creating a progressively wider stereo image.

SPREAD	LFO OFFSET	IMAGE
0%	0°	Mono compatible (authentic)
50%	90°	Spacious, still translates well to mono
100%	180°	Maximum width — notches sweep oppositely

Note: In Vintage Mode this knob is forced to 0 % and dimmed.

OUTPUT GAIN KNOB

Range: -12 dB to +12 dB | **Default:** 0 dB

A clean linear-gain trim applied after the phasing path. Use it to compensate for the small level shift at extreme settings, or to push the output into a downstream stage. The knob does not change the phaser's tone — it only scales the final output. Active in both Vintage and Modern modes.

VINTAGE TOGGLE

Options: Off (Modern) / On (Vintage) | **Default:** Off

Switches between Modern and Vintage operating modes.

BYPASS

Options: Off / On | **Default:** Off

- **Vintage Mode:** Instant pass-through (no crossfade)
- **Modern Mode:** Smooth crossfade bypass

SPEED CONTROLS

SLOW (BLUE BUTTON) - 0.5 HZ

The Slow setting creates a gentle, breathing effect with a full sweep taking approximately 2 seconds.

Best for:

- Subtle pad and ambient textures
- Slow, emotional ballads
- Adding gentle movement to sustained chords
- Classic 70s keyboard sounds

MEDIUM (YELLOW BUTTON) - 1.0 HZ

The Medium setting is the "classic" phaser sound - a balanced 1-second sweep that works in almost any context.

Best for:

- Classic rock guitar rhythm parts
- Funk and R&B rhythm guitar
- Keyboard textures
- General-purpose phasing

FAST (RED BUTTON) - 6.0 HZ

The Fast setting creates a vibrato-like warble effect, with the sweep completing approximately 6 times per second.

Best for:

- Vibrato-style effects on guitar or keys
- Psychedelic and experimental textures
- Creating tension and urgency
- Special effects and transitions

SPEED RAMPING BEHAVIOR

One of the most distinctive features of the PS-1A is its **Leslie-style speed ramping**. When you switch between speeds:

1. The LFO doesn't instantly jump to the new rate
2. Instead, it smoothly accelerates or decelerates
3. The time constant is approximately 0.5 seconds
4. After about 1.5 seconds, the new speed is reached

> **MUSICAL USE**
>
> - Switch from SLOW to FAST right before a chorus for a dramatic build
> - Switch from FAST to SLOW at the end of a section for a "winding down" effect
> - Automate speed changes in your DAW for evolving textures

PRESET BROWSER

The header preset cluster carries the active preset name and a set of compact navigation controls. Clicking the preset name opens the Preset Browser, a categorised picker covering both the factory bank and any user presets you save.

PRESET CHIP

Shows the name of the currently loaded preset. When the parameters drift away from the saved state — i.e. you start dialling controls — an amber asterisk appears next to the name to indicate the preset has been modified. The asterisk clears the moment a preset is reloaded or saved.

NAVIGATION ARROWS ◄ ►

Step through the combined factory + user list one preset at a time. The list wraps at both ends, so pressing ► at the last preset returns you to the first.

SAVE BUTTON

Opens a small naming prompt. Type a name and press Enter (or click **Save**) to write the current parameter state to disk as a `.preset` XML file. The file lives under your user data folder:

PLATFORM	PATH
macOS	`~/Library/Application Support/Niviem/Niviem Phase One/Presets/`
Windows	`%APPDATA%\Niviem\Niviem Phase One\Presets\`

User presets share the navigation list with factory presets. Saving under the same name as an existing user preset overwrites the file.

BROWSER MODAL

Clicking the preset chip opens the full browser. Factory presets are grouped by category; user presets, if any, appear in their own section at the end. Hovering over a user preset reveals a small **Delete** button on the right side of the row.

The 30 factory presets cover the common phaser idioms:

CATEGORY	DESCRIPTION
Init	Neutral starting point
Subtle	Gentle motion for mix enhancement

Classic	Authentic 70s PS-1A character at preset rates
Modern	Continuous customRate + stereo spread combinations
Synced	Tempo-locked variations across common note values
Vintage	Bit-faithful PS-1A recreations with Vintage Mode engaged
Creative	Wild and expressive — telephone, helicopter, underwater

Press **Escape**, click outside the dialog, or pick an entry to close the browser.

A/B COMPARE

A pair of header buttons sit to the left of the preset cluster. They give you two independent parameter snapshots — slot **A** and slot **B** — that you can compare on the fly without losing your work in either.

TOGGLE BUTTON (A / B)

Shows the active slot. Click to swap. The plugin captures whatever you have dialled in into the slot you are leaving, then restores the other slot's state. So you can:

1. Dial in a sound (slot A is active by default)
2. Click the toggle — slot B is now active and shows whatever you saved last to B (initially the same as A)
3. Edit the controls — your changes accumulate in slot B
4. Click toggle again — you are back in slot A with your original sound, untouched

Both slots carry the full plugin state: speed, rate, depth, sync, division, spread, output, vintage, and bypass.

COPY BUTTON (A→B / B→A)

The label flips to match the active slot's direction. Click to clone the current slot's state into the other slot — useful for "I like this; let me explore variations from the same starting point in the other slot."

The copy is destructive on the destination slot only; the source slot is unchanged.

TIPS & TECHNIQUES

CLASSIC 70S PHASER GUITAR

1. Enable **Vintage Mode**
2. Set speed to **MEDIUM**
3. Use a clean or slightly overdriven guitar tone
4. Play rhythm chords with light strumming
5. The phaser adds movement without overwhelming the fundamental tone

---

"THAT LADY" GUITAR SOUND

To recreate Ernie Isley's iconic phased guitar tone:

1. Enable **Vintage Mode**
2. Use a humbucker guitar with moderate overdrive
3. Set speed to **MEDIUM**
4. Play funky rhythmic patterns
5. Let the phaser sweep interact with your playing dynamics

ETHEREAL KEYBOARD PADS

1. Enable **Vintage Mode**
2. Set speed to **SLOW**
3. Apply to electric piano, organ, or synthesizer pads
4. Use sustained chords
5. The gentle sweep adds dimension and life to static sounds

SUBTLE MODERN PHASING

1. Disable **Vintage Mode**
2. Set **Depth** to 30-50%
3. Set speed to **SLOW** or **MEDIUM**
4. Great for adding gentle movement without obvious phasing
5. Works well on vocals and acoustic instruments

TEMPO-SYNCED EFFECTS

1. Disable **Vintage Mode**
2. Enable **Sync**

3. Choose speed based on desired rhythmic division
4. Great for electronic and modern productions
5. LFO stays locked to song tempo changes

STEREO ENHANCEMENT

NIVIEM Phase One applies the same modulation to both channels (mono-compatible). This means:

- No phase issues when summed to mono
- Consistent phasing across the stereo field
- Perfect for broadcasts and mono playback systems

TECHNICAL SPECIFICATIONS

AUDIO

SAMPLE RATES	BIT DEPTH	INTERNAL PRECISION
44.1 - 192 kHz	32-bit float	64-bit coefficients

LATENCY
0 samples

FILTER

SPECIFICATION	VALUE
Topology	6-stage cascaded first-order all-pass
Transfer Function	$H(z) = (a_1 + z^{-1}) / (1 + a_1 z^{-1})$
Break Frequency Range	20 Hz - 5000 Hz (logarithmic)
Notch Count	3 (N/2 where N = 6 stages)

LFO

SPECIFICATION	VALUE
Waveform	Triangle
Frequency Range	0.5 Hz - 6.0 Hz (presets)
Speed Ramping	First-order exponential (τ = 0.5s)
Phase Accumulator	Sample-accurate, drift-free

PROCESSING QUALITY

FEATURE	IMPLEMENTATION
Denormal Prevention	DC offset on filter state variables (1e-18)
Nyquist Protection	Coefficient clamped at 0.49 normalized frequency
DC Blocking	20 Hz first-order highpass on output
Thread Safety	Atomic parameters for lock-free audio processing
Parameter Smoothing	20ms exponential (Modern mode only)

PARAMETERS

PARAMETER	VALUES	DEFAULT
Speed	Slow, Medium, Fast	Slow
Depth	0–100 %	100 %
Sync	Off / On	Off
Sync Division	1/32 … 4/1 (15 entries)	1/4
Rate	0.05 – 12 Hz (skewed)	0.5 Hz
Stereo Spread	0–100 % (0° to 180° L/R offset)	0 %
Output Gain	-12 dB to +12 dB	0 dB
Vintage	Off / On	Off
Bypass	Off / On	Off

THE SCIENCE OF PHASING

HOW PHASE SHIFTERS WORK

A phaser works by splitting the audio signal into two paths:

1. **Dry Path** - The original signal passes through unchanged
2. **Wet Path** - The signal passes through all-pass filters that shift phase

When these paths are recombined, frequencies where the phase shift equals 180° (plus multiples of 360°) experience destructive interference, creating **notches** in the frequency spectrum.

ALL-PASS FILTERS

Unlike low-pass or high-pass filters, all-pass filters pass all frequencies with unity gain but introduce a frequency-dependent **phase shift**.

First-Order All-Pass Transfer Function:

```
        s - ωb
H(s) = ────────
        s + ωb
```

Where ωb is the "break" or "corner" frequency.

PHASE RESPONSE

```
φ(ω) = π - 2·arctan(ω/ωb)
```

- At DC (ω = 0): Phase shift = 180°
- At break frequency (ω = ωb): Phase shift = 90°
- At high frequency (ω → ∞): Phase shift = 0°

LOGARITHMIC FREQUENCY MAPPING

The break frequency is swept using **logarithmic** interpolation:

```
breakFreq = minFreq × (maxFreq / minFreq)^normalized
```

This is perceptually linear because human hearing perceives frequency logarithmically (each octave is a doubling of frequency).

NOTCH GENERATION

When dry and wet signals are mixed 1:1, notches occur where:

```
Total Phase Shift = 180° + n × 360°  (where n = 0, 1, 2, ...)
```

As the LFO sweeps the break frequency, these notches move through the spectrum, creating the characteristic "swooshing" sound.

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 Preferences > Security & Privacy if the plugin is blocked
- Run `auval -v aufx Nps1 Nivm` to verify AU installation

NO AUDIBLE EFFECT

- Ensure the plugin is not bypassed
- Verify input signal is present (check input meter in DAW)
- Check that the track is not muted
- Check **Depth** is above 0% (Modern mode)
- The phaser effect is subtle at some speeds - try FAST for the most obvious effect

EFFECT SOUNDS WRONG

- Ensure the source material has frequency content in the sweep range (20 Hz - 5 kHz)
- Very dark or very bright sources may not phase effectively
- The effect is most obvious on harmonically rich material (distorted guitar, organ, etc.)
- Try enabling **Vintage Mode** for authentic PS-1A behavior

SPEED CHANGES FEEL INSTANT

The PS-1A should have smooth speed ramping. If speeds change instantly:

- Ensure you have the latest version of the plugin

- The ramping time is approximately 1.5 seconds to reach 95% of target

CLICKS OR POPS

- Increase your DAW's buffer size (try 256 or 512 samples)
- In Modern mode, parameter smoothing should prevent clicks
- In Vintage mode, rapid parameter changes may cause artifacts (authentic behavior)
- Check for automation discontinuities

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

- **R.G. Keen - GeoFEX** - Traced Maestro PS-1A schematic, technical documentation and analysis (geofex.com)
- **Patchstorage** - PS-1A/PS-1B reference measurements, LFO rate verification (patchstorage.com)
- **FreestompBoxes.org** - Circuit analysis and discussion, component verification (freestompboxes.org)
- **David Morrin** - PS-1 technical notes, JFET specifications

TECHNICAL REFERENCES

- **Vadim Zavalishin** - "The Art of VA Filter Design" (filter theory)
- **CCRMA Stanford** - Phase shifter theory
- **WolfSound** - All-pass filter mathematics

SPECIAL THANKS

To **Tom Oberheim** for the original PS-1A design that revolutionized guitar effects.

To the countless artists who made the phaser a staple of recorded music.

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

VERSION HISTORY

VERSION 1.1

- **Continuous RATE knob** (Modern Free) — dial in any LFO rate from 0.05 Hz to 12 Hz; the three Speed rockers act as quick-presets that snap the knob to the authentic 0.5 / 1 / 6 Hz values.
- **Stereo Spread knob** (Modern) — independent L/R LFO phase offset for a wide modern stereo image; mono compatible at 0 %.
- **Tempo Sync now offers 15 note divisions** through a Klang-style picker modal, including triplets and dotted figures from 1/32 through 4/1.
- **Preset Browser** — 30 factory presets across 7 categories (Init, Subtle, Classic, Modern, Synced, Vintage, Creative), with user save / delete / rename to disk under your user data folder.
- **A/B Compare** in the header — instantly switch between two parameter snapshots; copy in either direction.
- **Output Gain trim** ±12 dB.
- **Active-gesture sync fix** — knob drags no longer fight the host-to-UI parameter sync at high refresh rates.
- **Premium chassis redesign** — cream faceplate with chrome-bezel phase-shift display, brass / aged-metal knob skirts, dark Bakelite caps with amber needles; section labels engraved on the chassis-bottom silkscreen line.
- Vintage Mode signal path is bit-identical to v1.0 — every Modern feature added in this release is gated behind the Modern toggle and forced inert when Vintage is engaged.

VERSION 1.0 (JANUARY 2026)

- Initial release
- **Dual Operating Modes**:
  - **Vintage Mode** - 100% authentic PS-1A processing
  - **Modern Mode** - Enhanced with Depth and Tempo Sync
- Authentic 6-stage all-pass filter cascade
- Three speed presets (Slow/Medium/Fast)
- Leslie-style speed ramping
- Stereo processing with mono compatibility
- Premium DSP quality:
  - 64-bit coefficient calculations
  - DC blocking on output
  - Denormal prevention
  - Parameter smoothing (Modern mode)
  - Click-free bypass crossfade (Modern mode)
- WebView-based authentic UI:
  - Lowrey-style speed buttons with glow
  - Animated LFO indicator (color-coded)
  - Depth tooltip on hover
  - Full keyboard accessibility (Tab + Arrow keys)
  - WCAG AA contrast compliance

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