

Apex Amp: Advanced Sound Design & Master Tone Manual

01. Advanced Signal Architecture & Gain Staging

Apex Amp is engineered around a 26-module professional signal chain. Understanding how audio moves through the pre-gain shaping, non-linear saturation, power-amp bloom, and spatial processors allows sound designers to craft world-class guitar tones for any genre.

[Input Trim] → [Noise Gate] → [Pickup Profiler] → [Pitch / Octaver] → [Dynamics Comp] → [Pre-Rig Boost / Fuzz / Drive] → [Pre-EQ HPF & Mute Tamer] → [8-Stage Tube Preamp] → [Tone Stack] → [Power Amp Sag & Bloom] → [Dual-Mic Cabinet Studio] → [Post-Modulation] → [Graphic EQ] → [Dual Delay Suite] → [Elite Ambience Reverb] → [Stereo / M/S Suite] → [Brickwall Limiter]

1. Preamp Saturation & Engine Models

- Boutique Engine (0)**: Smooth, symmetric tube clipping algorithm designed for sparkling cleans, edge-of-breakup blues, and classic rock.
- Hot-Rod Engine (1)**: High-density asymmetric tube clipping for searing 80s lead tones, thrash metal, and modern rock solos.
- Nuclear Engine (2)**: Jagged, ultra-aggressive saturation algorithm engineered for industrial metal, percussive djent, and extreme clank.
- Active Tube Stages** (`clipStages`): Dynamically scales the serial tube gain stages from 1 stage (clean headroom) up to 8 stages (extreme sustain).
- Inter-stage Low-Pass Filter** (`interStageLpf`): Controls high-frequency harmonic accumulation between clipping stages (10kHz to 20kHz). Lower values (12kHz–14kHz) eliminate digital fizz on high-gain tones.

2. Pre-Gain Tightness & Palm-Mute Sculpting

- Pre-EQ High-Pass Filter** (`preEqHpFreq`): Filters sub-bass rumble (20Hz–500Hz) before saturation. Setting this to 140Hz–200Hz tightens palm-muted low-end.
- Mute Tamer** (`tamerDepth`): A specialized 200Hz dynamic notch filter that dynamically dampens boomy palm-mute buildup on heavy rhythm tracks without thinning out open chords.

3. Power-Amp Sag & Dynamic Bloom

- Voltage Sag** (`paSag`): Simulates the power supply B+ voltage drop when the power tubes are pushed hard. Provides natural dynamic compression and organic squish.
- Sag Attack & Release** (`paSagAttack` , `paSagRelease`): Slow attack (>15ms) allows pick transients to pop before compression sets in. Fast release (<60ms) creates snappy, modern responsiveness.
- Depth & Presence** (`paDepthGain` , `paPresenceGain`): Controls low-end cabinet thump (40Hz–120Hz) and top-end cutting power (6.5kHz–9kHz) generated directly inside the power stage.

4. Dual-Mic Cabinet Studio

- Mic Profiles** (`micAType` , `micBType`): Select between classic dynamic mics (SM57, MD421), ribbon mics (R-121, R-10), and condenser mics (C414, Flat).
- Axis Position** (`micATilt` , `micBTilt`): Blends from dark off-axis (0.0) to razor-sharp on-center grille placement (1.0).

- **Distance & Proximity** (`micADist` , `micBDist`): Simulates physical proximity boost (close grille) or room air reflection (far placement).
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02. Advanced Sound Design Recipes

Recipe 1: Surgical Djent & Modern Metal

- **Preamp Engine**: Hot-Rod Engine (1), `clipStages` = 5, `preampGain` = 0.72.
- **Pre-Gain Shaping**: `preEqHpffreq` = 180Hz, Overdrive Green TS (`driveType` = 1, `driveGain` = 0.15, `driveHpf` = 220Hz), `tamerDepth` = 0.75.
- **Power Amp**: `paSag` = 0.0 (maximum transient snap), `paDepthGain` = +3.5dB at 80Hz for sub-thump.
- **Cabinet**: Stadium Aggressive Cab (2), `cabTilt` = 0.75, `cabHighCut` = 9000Hz.
- **Post-EQ**: 10-Band V-Curve (Scoop 500Hz by -3dB, Boost 16kHz Air by +2dB).

Recipe 2: Ambient Shimmer & Atmospheric Pads

- **Rig Voicing**: Boutique Engine (0), `preampGain` = 0.35 (Pristine Clean).
- **Pitch Shifter**: `pitchEnabled` = 1, `pitchType` = Crystal Pad (1), `pitchSemitones` = +12, `pitchMix` = 0.35.
- **Reverb Tank**: Reverb Type = Crystal (4), `reverbSize` = 0.90, `reverbShimmer` = 0.65, `reverbMix` = 0.45.
- **Delay Engine**: Ping-Pong Delay (3), `delayTime` = 450ms, `delaySync` = 1 (1/8D), `delayFeedback` = 0.55.
- **Stereo Suite**: `stereoEnabled` = 1, `widenerEnabled` = 1, `msSideAir` = 0.20.

Recipe 3: Cyberpunk Synth & Lead Workstation

- **Synth Engine**: `synthEnabled` = 1, `synthOsc1Wave` = Sawtooth (0), `synthSubWave` = Square (1), `synthSubOctave` = -1.
- **Filter & Modulation**: Moog Ladder 24dB LPF (`synthCutoff` = 1800Hz, `synthResonance` = 0.65), LFO Cutoff Sweep (`synthLfoDest` = 0, `synthLfoRate` = 2.5Hz).
- **Distortion Shaping**: `synthWavefold` = 0.40, `synthDrive` = 0.60.
- **Delay & Reverb**: Tape Delay (`delayType` = 2, flutter mod = 0.3), Hall Reverb (`reverbType` = 3).

Recipe 4: Humbucker-to-Acoustic Transformation

- **Pickup Profiler (PPT)**: `srcProfile` = Humbucker (0), `targetProfile` = Acoustic Sim (7), `profileDepth` = 1.0.
 - **Preamp Routing**: Tube Bypass (`preampGain` = 0.05, `clipStages` = 1, `nuclearMode` = 0).
 - **Acoustic Body Convolution**: Acoustic soundboard body impulse response automatically engaged with 75Hz body HPF and transient expansion.
 - **Cabinet**: `cabType` = 0 (Bypass cab for direct acoustic resonance).
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03. Comprehensive Parameter Reference

1. Master System & Tuning

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Master Input Trim [masterInputGain]	-18.0 to +18.0 dB	0.0 dB	Global input calibration for guitar pickup output.
Preset Volume Trim [inputGain]	-18.0 to +18.0 dB	0.0 dB	Preset-level input trim for gain-staging adjustment.
Master Rig Output [masterVol]	0.0 to 1.0	0.8	Preset output volume trim.
Safety Brickwall Limiter [masterLimiter]	Off / On	On	Peak brickwall safety limiter preventing digital clipping.
Strobe Guitar Tuner [tunerEnabled]	Off / On	Off	Strobe guitar tuner tapped directly at input.

2. Pickup Profiler (PPT) & Physical Modeling

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
My Guitar Pickups [srcProfile]	0 to 7 (Choice)	Humbucker	Hardware guitar pickup selection anchor.
Target Pickup Model [targetProfile]	0 to 7 (Choice)	Humbucker	Target physical pickup model (Strat, Tele, PAF, Acoustic Sim, etc.).
Pickup Morpher Depth [profileDepth]	0.0 to 1.0	0.0	Transformation depth blending magnetic pickup characteristics.
Cable Warmth [cableCapacitance]	0.0 to 1.0	0.0	High-frequency cable roll-off simulation (10ft to 30ft coiled cable feel).

3. Pitch Shifter & Harmonic Suite

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Drop-Tuner Switch [pitchEnabled]	Off / On	Off	Engages the polyphonic/monophonic pitch shifter.
Drop-Tune Algorithm [pitchType]	Solo / Poly / Octaver / Detune	Solo	Algorithm selection (Solo tracking, Ambient Poly, Subharmonic OC-5, MicroPitch).
Drop-Tune Semitones [pitchSemitones]	-24 to +24 ST	0 ST	Pitch shift interval (-2 Octaves to +2 Octaves).
Drop-Tune Blend [pitchMix]	0.0 to 1.0	0.0	Dry/Wet pitch blend using parallel gain preservation.

4. Noise Gate & Studio Compressor

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Noise Gate Switch [gateEnabled]	Off / On	On	Toggles the high-speed background noise gate.
Gate Threshold [gateThreshold]	-100 to 0 dB	-60 dB	Noise floor threshold pivot for gating hum and hiss.
Studio Compressor [compEnabled]	Off / On	Off	Studio feedback compressor enable.
Compressor Threshold [compThreshold]	-60 to 0 dB	-20 dB	Compression threshold level.
Compressor Strength [compRatio]	1:1 to 20:1	4:1	Compression ratio intensity.

5. Preamp & Overdrive Workstation

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Treble Boost Pedal [boostEnabled / boostGain]	Off/On / 0–20 dB	Off / 0 dB	Clean FET treble boost before the main preamp.
Germanium Fuzz [fuzzEnabled / fuzzGain]	Off/On / 0–1	Off / 0.5	Germanium fuzz soft-clipper with DC blocking.
Overdrive Model [driveType]	Std / Green / Hard	Std	Overdrive pedal character model (TS, OCD, Klon).
Overdrive Drive / Tone [driveGain / driveTone]	0.0 to 1.0	0.5 / 0.5	Drive gain saturation & high-frequency tone tilt.
Preamp Gain [preampGain]	0.0 to 1.0	0.5	Multi-stage tube preamp drive.
Active Tube Count [clipStages]	1.0 to 8.0	4.0	Active triode gain stages in series.
Hot-Rod Engine Mode [nuclearMode]	Boutique / Hot-Rod / Nuclear	Boutique	Saturation engine clipping math selector.
Tightness Low Cut [preEqHpFFreq]	20 to 500 Hz	80 Hz	Pre-gain low-end cleanup high-pass filter.
Palm-Mute Tamer [tamerDepth]	0.0 to 1.0	0.0	Dynamic 200Hz palm-mute tamer notch intensity.

6. Power Amp & Tone Stack

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Amp Equalizer [tsBass / tsMid / tsTreble / tsPresence]	0.0 to 1.0	0.5	Passive 3-band tone stack and top-end presence.
Power Amp Push [paGain]	0.0 to 2.0	0.5	Power amp output transformer push.

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Voltage Sag [paSag]	0.0 to 1.0	0.2	B+ supply voltage envelope compression.
Sag Attack / Release [paSagAttack / paSagRelease]	0.1–50ms / 1–1000ms	2ms / 100ms	Sag compression attack & recovery dynamics.

7. Cabinet Studio & Dual-Mic Array

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Speaker Cabinet Model [cabType]	0 to 30 (Choice)	1	30 Stereo Impulse Response Cabinet Library (0=Bypass).
Mic Position (Center/Edge) [cabTilt]	0.0 to 1.0	0.2	Mic placement tilt (0.0=Dark off-axis, 1.0=Bright on-center).
Mic Distance [cabDistance]	0.0 to 1.0	0.2	Physical proximity air distance (0.0=Grille, 1.0=Room).
Dual Mic Studio Switch [dualMicEnabled]	Off / On	Off	Engages parallel dual-mic cabinet blending.
Microphone A / B Model [micAType / micBType]	SM57 / MD421 / R121 / R10 / C414 / Flat	SM57 / R121	Microphones selected for Dual-Mic Studio.
Dual Mic Crossfader [dualMicBlend]	0.0 to 1.0	0.4	Crossfade balance between Microphone A and Microphone B.

8. Modulation, Delay & Ambience Suite

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Modulation Pedals [chorusEnabled / flangerEnabled / phaserEnabled]	Off / On	Off	Studio modulation pedals.
Modulation Position [modPosition]	Pre / Post	Pre	Mod placement (Pre-Amp for analog grit, Post-Amp for pristine studio).
Echo Delay 1 & 2 [delayEnabled / delayTime / delayMix]	Off/On / 1–2000ms / 0–1	Off / 350ms / 0.3	Primary delay engine with Ping-Pong & Tape modes.
Delay Shimmer [delayShimmer]	0.0 to 1.0	0.0	Feedback octave pitch-shifter intensity.
Reverb Tanks 1 & 2 [reverbEnabled / reverbType]	Off / On	Off	Elite Ambience reverb tank (Spring, Plate, Room, Hall, Crystal, Cloud).
Reverb Size & Shimmer [reverbSize / reverbMix / reverbShimmer]	0.0 to 1.0	0.5 / 0.2 / 0.0	Reverb decay room size, dry/wet mix, and shimmer tail.

9. Turbo Synth PRO Workstation

CONTROL NAME & PARAMETER ID	RANGE	DEFAULT	SONIC PURPOSE
Guitar Synth Switch [synthEnabled / synthMix]	Off / On / 0–1	Off / 1.0	Master polyphonic synth workstation toggle & mix.
Oscillator Waveforms [synthOsc1Wave / synthOsc2Wave / synthSubWave]	Saw / Sq / Pulse / Tri / Sine / Ramp / DoubleSaw / Supersaw / Trap	Saw	Anti-aliased oscillator waveform selectors.
Synth Cutoff & Resonance [synthCutoff / synthResonance]	100–15000 Hz / 0–0.99	2000 Hz / 0.5	24dB Moog ladder low-pass filter & Q feedback.
Synth Wavefolder [synthWavefold]	0.0 to 1.0	0.0	Harmonic wavefolding distortion modifier.

04. AI Connection Hub & Multi-Provider Guide

Apex Amp features an intelligent AI Assistant capable of mapping plain-text requests (e.g. *"Give me a heavy 90s Grunge tone with a tight low end and subtle chorus"*) to complex 293-parameter rig configurations.

The **AI Connection Hub** in the plugin header supports 4 primary provider categories:

- Google Gemini (Recommended & Free):** Set up in 1 minute using a free API key from Google AI Studio (`https://aistudio.google.com/app/apikey`).
- Anthropic Claude:** High-accuracy tone mapping using Claude 3.5 Sonnet or Haiku.
- OpenAI & Custom Endpoints:** Connect direct OpenAI keys or custom base URLs for third-party aggregators (OpenRouter `https://openrouter.ai/api/v1`, DeepSeek `https://api.deepseek.com/v1`, Groq, or vLLM).
- Local LLMs (Ollama / LM Studio):** Run 100% offline local models (`ollama run llama3`) for complete DAW privacy with zero cloud dependencies.

For detailed step-by-step instructions, see the dedicated [AI Setup Guide](#).