Princeton Thermionic
Volcano User's Manual

Thank you for the purchase of your Princeton Thermionic Pure Tube guitar amplifier!
This document explains how to feed and care for your new amp.

ABOUT THE VOLCANO 1x12" COMBO AMPLIFIER

The Volcano is a single channel high gain guitar amplifier. With a Plexi-inspired voice, the Volcano includes Treble, Middle, and Bass EQ controls in addition to two cascading Gain controls and a dedicated Master Volume control. The timbre of the amp can be further adjusted with the Lava and Magma controls, which adjust the high and low frequency headroom. The EQ section has been custom designed to replicate certain aspects of a very famous amplifier used to amplify a very famous Frankenstrat, and a Dormant switch is also provided to bypass the EQ controls completely. Ash and Cinder switches add brightness, while Light Eruption and Heavy Eruption switches kick in a light, sweet overdrive and a dark, roasted distortion. The preamp section is powered by three military-grade, low-noise/high output CV4004 tubes. The output section is comprised of a matched pair of 6V6GT tubes, and a classic diode rectifier provides clean, high voltage DC power. The cabinet is 100% solid pine, with many custom covering and speaker grill options. The speaker is a 12" Celestion G12EVH. The rear panel offers some unique tone-shaping options that are critical in obtaining the Brown Sound – the Crater Heat control is a Variac emulator, allowing custom-tuning of compression and saturation for that special '70s and '80s brown sound; the Mantle Pressure switch offers three levels of feedback flowing to the Lava and Magma controls. The FX Loop allows for pedals to be inserted after the preamp section. The Volcano has built-in protection for the tubes and transformers, utilizing traditional fuses as well as Princeton Thermionic's unique Pyroclastic Protection system, which provides thermal insulation and eliminates the need for a manual Standby switch. An optional -30dB attenuation module can also be added for full cranked tube tone at lower speaker volumes. 20 Watts of musical power make the Volcano a great smaller amp for getting BIG amp sound. Oh, and did we mention it's a Pure Tube circuit? No transistors used, ever.

QUICK START GUIDE

1) Set rear panel POWER switch in the OFF position
2) Set all rotary tone controls on the top panel to 12:00 (clock face)
3) Set GAIN and DRIVE controls at just above minimum, around 7:00 (clock face)
4) Plug the included power cable from the amp's rear panel MAINS cable inlet to your wall power
5) Plug your guitar into the input jack on the top panel, using a ¼" instrument cable
6) Switch rear panel POWER switch in the "ON" position
7) Wait a few seconds for the Pyroclastic Protection circuit to warm up the tubes
8) ROCK!

PRINCETON THERMIONIC
Handcrafted Tube Amps USA

SPECIFICATIONS

MODEL: Princeton Thermionic Volcano

TYPE: Top Control 1x12 Combo Cabinet with High Gain Pure Tube Circuit

INPUT POWER: 120VAC, 60Hz

INPUT SIGNAL IMPEDANCE: 100kΩ

OUTPUT IMPEDANCE: 16Ω

POWER AMP OUTPUT: 20W into 16Ω @ < 10% THD, 80Hz - 8kHz

SPEAKER: 15Ω, 12", Celestion G12EVH

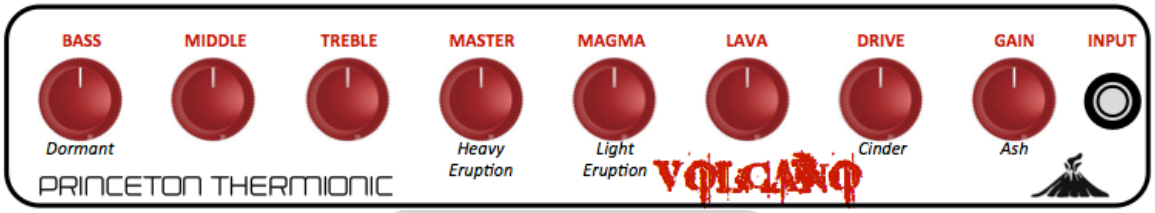
DIMENSIONS:
HEIGHT: 16 in (41 cm)
WIDTH: 20 in (51 cm)
DEPTH: 11 in (28cm)

WEIGHT: 32 lb. (15 kg)

OPTIONS:
1) Also available as a head (no speaker), 2x12" combo, and 2X10" combo.
2) Many custom finishes available; please inquire directly.
3) Custom handmade -30dB attenuator module for loud tone yet quiet volume.
4) Many speaker options available, alnico to ceramic to neo; please inquire directly.
5) A buffered active FX loop may be added upon request.

Princeton Thermionic amplifiers are custom handmade instruments.
Product specifications are subject to change without notice.
Any such changes would normally be improvements.

TOP PANEL CONTROLS



From right to left:

1) **INPUT** ¼" jack for instrument cable. Plug your guitar in here for that Brown Sound.

2) **GAIN** sets the first stage gain level of the amp.
Pull to enable ASH, a bright control.

3) **DRIVE** sets the 2nd stage gain and distortion level of the amp.
Pull to enable CINDER, a bright control.

4) **LAVA** adjusts the mid-high frequencies of the headroom feedback circuit.

5) **MAGMA** adjusts the low-mid frequencies of the headroom feedback circuit.
Pull to enable LIGHT ERUPTION, a moderate overdrive feature.

6) **MASTER** sets the overall volume level of the amp.
Pull to enable HEAVY ERUPTION, a full-on distortion feature.

7) **TREBLE** adjusts the high frequency response.

8) **MIDDLE** adjusts the midrange frequency response.

9) **BASS** adjusts low frequencies.
Pull to select DORMANT, disabling all 3 EQ controls for a flat frequency response tone.

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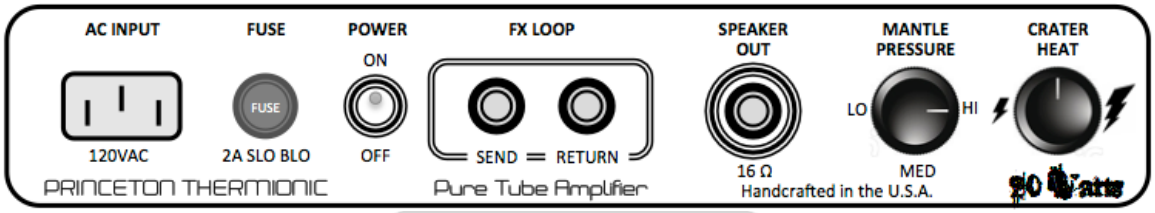
REAR PANEL CONTROLS



From left to right:

1) **MAINS INPUT** IEC cable inlet – plug the IEC power cable into this inlet to power your amplifier.

2) **MAINS FUSE** is used to protect your amplifier from voltage spikes or excessive current draw. Replace only when necessary with 2A Slo-Blo fuse.

3) **POWER** two-way toggle switch powers the amp on and off.

4) **FX LOOP** post-preamp FX send & return jacks.

5) **SPEAKER OUT** the 16-Ohm combo jack is a hybrid connector combining the speakON locking chassis socket with a traditional 1/4" jack, permitting connection using either type of plug. The combo jack mates with a locking 2-pole speakON cable connector from the speaker for security. If you ever decide to swap speakers and use a traditional 1/4" jack plug instead, the combo jack also works just fine with that type of plug.

NOTE – never turn your amplifier to OPERATE mode ("ON" position on POWER) without connecting the speaker lead to the amplifier. Failing to do so WILL damage your amplifier!

5) **MANTLE PRESSURE** three-way toggle switch selects the level of negative feedback in the amplifier. Negative feedback tightens the response of the amp, increase headroom while decreasing breakup and harmonic content.

6) **CRATER HEAT** a Variac emulator, this dial allows fine-tuning of compression and saturation for that special '70s and '80s brown sound. While the "famous" Variac was used to dial down the mains AC high voltage into a 100-Watt amp with modified bias and EQ settings, our Crater Heat control safely replicates the sonic result by adjusting the low voltage AC signal in the gain stages of the Volcano's preamp section.

TUBE COMPLIMENT AND BIAS ADJUSTMENT
From left to right:

V1 – CV4004 (12AX7/ECC83)	…Input gain stages
V2 – CV4004 (12AX7/ECC83)	…Third gain stage and tone stack cathode follower
V3 – CV4004 (12AX7/ECC83)	…Phase inverter
V4 – 6V6GT	…Output Tube
V5 – 6V6GT	…Output Tube

The Volcano employs a traditional Adjustable Fixed Bias.

Princeton Thermionic amplifiers are fitted at the shop with the highest quality Mullard vacuum tubes.

FREQUENTLY ASKED QUESTIONS

Can I substitute different tube types?
In the preamp (V1-V2), you can try 12AT7s, 12AU7s, 5751s without any harm; the design is optimized for 12AX7s, which are therefore the only recommended tube in the preamp positions. We fit Mullard CV4004 tubes standard, which are a military grade 12AX7 with awesome sonic qualities. In the power amp (V4-V5), you must use 6V6 tubes. We fit Mullard 6V6GT tubes as standard components.

Do I need to use a matched and balanced phase inverter tube?
While it is not necessary, we do fit a balanced, low noise, low microphonics Mullard CV4004 tube with matched triodes as the standard V3 component. Radically unbalanced tubes, such as the 12DW7, are not recommended because a reasonable balance is desirable. However, any regular 12AX7 type tube may be used here, even if the triodes are not perfectly matched.

I've read that the components used in the amplifier are really important. What is inside my amplifier?
This is a custom, handmade audio amplifier, built in the old school traditions. We use the highest quality, best-sounding parts available, sourced globally. For example, the electrolytic capacitors are made in the Czech Republic by **JJ Electronic**; the signal capacitors are self-healing polyester film/foil capacitors made in the USA by **Mallory**; the tube sockets are high quality Micalex by **Belton** in South Korea; the potentiometers are premium from **Alpha** in Taiwan, the input jacks are by **Cliff Electronic Components** in the UK; the locking speaker jack is by **Neutrik** in Liechtenstein; the signal resistors are precision metal film by **Precision Resistive Products** in the USA; the bias capacitor is by **Sprague** in the USA; the screen resistors are the premium reduced mass wirewound type by **Draloric** in Germany. We use the traditional **point-to-point** method of component mounting rather than modern, cheaper PCBs. We also use heavy gauge, Teflon insulated, military specification, aerospace grade, silver-plated copper hookup wire from **Alphawire** in the USA throughout the circuit. One exception is the lines to and from the FX Loop – for these sensitive lines we use special copper shielded low noise wire from **Mogami** in Japan. We use new production vacuum tubes by **Mullard** in Russia. We use a specially voiced speaker by **Celestion** in the UK.

Is this amplifier Class A or Class AB? And which is better?
This amp operates in Class AB. There has been a lot of marketing hype over the years by a variety of manufacturers regarding Class A vs. Class AB. To keep it simple, think of operating class this way: In Class A operation, current always flows through the plate of each tube. In class AB operation, current flows through the tube plates part of the time only, and the tubes take turns handling different sections of the input cycle. A benefit of Class AB is the circuit can produce more power. The Volcano is biased so that current flows in each plate for more than half of the cycle but less than the entire cycle, resulting in full, rich harmonics and lush musical tone.

Is this amplifier single-ended or push-pull?
This amp employs a push-pull topology. This is why the circuit includes a phase inverter tube (V3). Push-pull is more efficient and powerful than single-ended designs.

How is this amplifier biased?
This amp is adjustable fixed-biased. This is a traditional bias method that was used in the British amplifier that inspired the Volcano.

What is your background – why are you qualified to build handmade amplifiers?
I had taken electronics courses in school, and I was familiar with high voltage from building light show systems and running lights and sound for some bands and DJs in New England during the 1980s. My older brother founded an electronics company originally called Rocklight Engineering and I helped him build, install and operate lightshow and audio gear for bands and clubs. His company grew into a leading theatrical supply company, The Production Advantage. He showed me how to use the tools of the trade --

multimeter, oscilloscope, variac, heatsinks, and how to solder components properly. We made some crazy strobe lights out of Navy aircraft landing lights. We set up keyboards to control the par lamps and fog machines -- all solid, heavy gauge, handwired stuff. Occasionally we'd chase each other around his workshop with charged Sprague electrolytic capacitors zapping each other. There was a memorable trip to the ER to flush some errantly squirted tube cleaner out of an eyeball. Ahh, the good old days...
…then, in 2018 I retired from a career on Wall Street and wanted to spend more time playing guitar. I decided to get back into building electronics with tube amps and effects pedals. The original concept I had was to build a "Tweed-style Tone Monster" the compact portable size of a 1980s Fender Super Champ, the 18 Watt tube amplifier I played in my rock bands during high school (Back in those days I scratch built a talkbox out of an Electro-Voice horn driver and some UV fluorescent plastic tubing, in an aluminum enclosure that I TIG welded). So I put together a nice little electronics shop in my buddy's barn. I started Princeton Thermionic with a two-channel 18 Watt 1x12 combo in 2018 (the Denim Deluxe) – this was the first Fullerwell circuit. In 2019 I also built a new talkbox and a couple of custom overdrive pedals. In 2020 I added a bigger, beefier 36 Watt version of the Fullerwell, which found immediate demand among local area guitarists in New Jersey, Pennsylvania and the tri-state area. Sadly, in 2020, we learned of the passing of Eddie Van Halen who was one of my childhood guitar heroes and I decided to build a tribute amp, which became the Volcano. It is not a "replica" of his amp by any means, although it does have certain similar circuit features.

Can I service the amp myself?
You can change tubes, but be sure to let them cool down before grabbing them, no reason to burn your fingers! You can also replace the 2 Amp Slow-Blow fuse on the rear panel if it blows due to some external electricity spike. Other than that, we recommend returning the amp to us, or to a qualified local tube amp technician, for any other service. **There is extremely high voltage inside the chassis, even when the amp is unplugged or turned off. This high voltage can kill you.** There are no user-servicable parts inside the amp. So why take a chance of dying?

How should I mic this amp for stage use with a PA, and for studio recording?
You can mic this amp just as you would with any other combo amp. For example, many sound engineers like to record these tone machines by putting a microphone in front, slightly off axis of the speaker to get a crunchy, bluesy tone. Or they move the microphone to be centered directly in front to get an upfront rock tone. One method we really like for a HUGE sound is to record using two microphones, one in front of the speaker, as above, and a second microphone behind the speaker. The second signal will be out of phase, so be sure to reverse this microphone's phase at the console's preamp. We like Sure SM57 microphones for this setup.

Does this amp offer an effects loop for my pedalboard?
Yes. We recommend running high-gain pedals such as fuzz and overdrives between the guitar and the input jack. Then the amp also offers a rear panel FX loop that is especially well suited for time-based pedals: **Modulation** (such as phase shifter, tremolo, chorus, flanger, rotating speaker simulator, etc.), **Delay** (analog, digital, tape, etc.) and **Reverb**.

Why is the amp called the "Volcano"?
The Volcano is designed around the "Brown Sound" of Van Halen. You can't play Eruption without a Volcano. It's our way of paying homage and respect to one of the greatest guitarists of all time.

What should I do in an emergency?
Better save the women and children first.