

Taming the Beast:

How to Control the Hot Rod's Volume

	PROS	CONS
<u>Volume Box</u>	Inexpensive. Doesn't void warranty. Helps control volume.	You have to make it yourself, or buy one on ebay. Lowers preamp, won't cause powertube saturation.
<u>Master Volume mod</u>	Lowers Drive channels to a practicable level. Master isn't so "touchy." Most inexpensive if you do it yourself.	voids the warranty. You have to do it yourself, or pay someone.
<u>Attenuator</u>	Allows you to lower volume AND get poweramp saturation. More Transparent than the volume box. Doesn't void warranty.	Somewhat expensive.
<u>Half Power Switch (Pentode-Triode Switch)</u>	Lowers the volume by approximately 40%. Soften and warms up the sound of your amp—if you like it.	voids Warranty. You need good electronic knowledge to install it, or pay a tech. A new hole needs to be drilled in the chassis. Dulls the sound, makes your amp sound like a blanket is overtop of it—if you don't like it. Causes impedance mismatch.
<u>Lower Gain Tubes (12AT7, 12AY7, etc)</u>	Doesn't void warranty. Slightly lowers the volume, may even result in a more pleasant sound.	Lowering the gain will make power tube distortion less likely. Doesn't make a big difference in volume unless used in all preamp spots. This will also change the sound which may or may not be desirable.
<u>EL84 Adapter</u>	Doesn't void warranty. You may like the sound of your amp.	Only lowers volume at gig levels. Earlier break up, less headroom, big sound of clean channel is gone.
<u>Pulling Tubes</u>	None.	Our amp won't work. This CANNOT be done to a Hot Rod Deluxe or Deville.

Power Amp Saturation

What is poweramp saturation (more commonly called "poweramp distortion"), and why do I judge all the options above by it? First of all, everything in the above table lowers the HRD's volume, but not every one helps us achieve power amp saturation. In many people's opinions, including myself, it is the epitome of great guitar tone. But to get poweramp saturation we MUST hit the power tubes with as much of our guitar's signal as we can muster. The only way to do this is by turning the volume knobs up. There will be a point when you notice that your amp doesn't get much louder, but the amp feels more dynamic and sustains. This is when you know you're in poweramp saturation land.

Why did I usually say "saturation" instead of distortion? Distortion is sort of ambiguous because there are many different types. What most people call tube distortion is actually what tube enthusiasts know as "saturation." Tubes do not distort, they saturate. Sometimes an amplifying device (vacuum tube, transistor, JFET, etc) is forced to amplify a large signal. Sometimes this input signal is so large that the tube can not possibly amplify the whole thing. Instead of producing a "perfect" copy, the tube is driven into saturation and produces a "distorted" copy. On an oscilloscope the output signal will literally look distorted when compared to the input signal. This is known as *amplitude distortion* or "clipping." Saturation occurs when we hit a tube with enough grid voltage that the plate current "tops off" and won't raise much higher. We're essentially driving the tube so hard that the plate is attracting as many electrons as it can from the cathode. It's maxed out. The sound of a tube working hard can be wonderful because of the increase in even-order harmonics, and is the reason why many guitarists still use tube amps.

Distortion, in the electronics world, is usually something we do not want. It usually interferes with the quality/purity of our source signal and inhibits good performance. An example in guitar amps would be crossover distortion in the power amp, or transient distortion in the loudspeaker. On the other hand, anything that increases even-order harmonics is good. An example would be the amplitude distortion from tube saturation that we've talked about, or the nice 2nd order harmonics achieved from carbon-composition resistors. Generally, what most guitarists describe as "overdrive," is really poweramp saturation, and what they call "distortion" is usually preamp saturation. It is very common for our favorite guitar heroes to use both types at the same time.

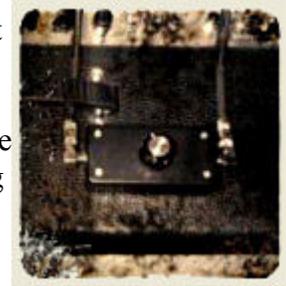
NOTE: It should be realized that *power amp* and *power tube* saturation are usually used interchangeably, but technically mean slightly different things. Most people don't realize that your output transformer also saturates and plays a part in the sound of your amp. Poweramp saturation usually refers to the combined sound of the phase inverter, power tubes, and output transformer. Power tube saturation is usually just the sound of the power tubes themselves. This is why attenuators go between the output transformer and the speaker, so that the sound of the OT is not neglected.

Now that we understand what poweramp saturation is, we'll discuss our options in a section I like to call "Taming the Beast." Remember, quite a few of these can be used together.

The Volume Box

Many people at the FDP really love their volume box. There have even been a few variations such as a SPST switch to toggle it in and out of the effects loop, and optional treble bypass. There are a few cons though. It must be placed in the effects loop, and many people don't like the sound of the effects loop, myself being one—I never use mine. In my opinion, the effects loop seems to take something away from the sound. Placing it between your guitar and the amp is rather pointless, you may as well use the volume knob on your guitar.

One very common misconception is that the volume box can help get power tube saturation at lower volumes. This is totally false. The volume box, when in the effects loop, is placed BEFORE the power amplification circuit. Turning down the volume of the box is the same as turning down the Master on the drive channel. It's simply lowering the preamp signal, and we need A LOT of signal to drive the power tubes into saturation. **DO NOT PUT THE VOLUME BOX BETWEEN THE OUTPUT TRANSFORMER AND THE SPEAKER!** It's not designed to go there! If you dismiss this warning I'm not totally certain what will happen (it'll probably fry your volume box then, because there's no load, fry your amp), but I can promise you that it won't be good.

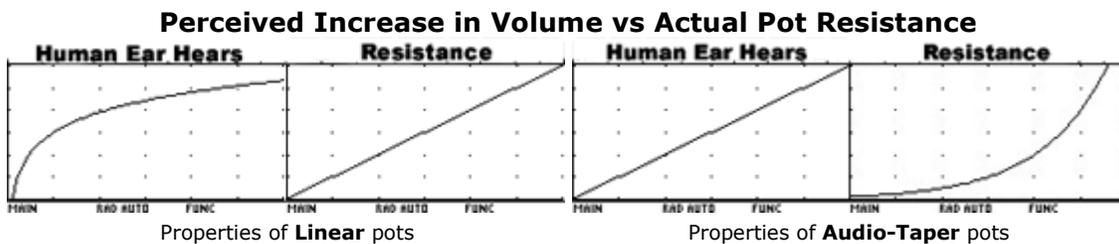


Personally, I found the volume box most useful for nerfing the Master's touchiness. Having the ability to adjust the drive channel to practice levels is definitely a plus in my book. It can also lower the volume of the clean channel later in the circuit, but this would cause the clean channel to function exactly like the drive channel—the preamp is driven into saturation and the large amount of gain is controlled before the poweramp with a pot. Some people like to use it for controlling both the volume of both channels with one knob.

If you don't want to void your warranty, you don't have a lot of money, AND you want to control the touchy Master; then the Volume Box is the way to go IMO. To learn how to make one go to the [Volume Box Homepage](#). If you'd rather just buy one, you can search [ebay](#), but I personally don't trust the guy. Once you have your box, if you find it muddy at lower volumes try adding a [treble bypass](#).

Master Volume Mod

If you've read the [Vanden Berg mods](#), you know that Fender uses a *linear* pot for the Drive channel instead of the practical *logarithmic* pot—often called "audio taper." This is done so shopping musicians will think the amp is more powerful than it is, (not that it *isn't* powerful). As a result the guitarist may be impressed enough to take the amp home. Once they get it home though, the novelty wears off and they find it's *too* loud for practice. How often do you hear Hot Rod owners gripe about how loud their amp is? The fact is, most of the volume increase occurs between 1 and 4 on the dial, and the remaining 8 notches result in little volume increase. It's somewhat of a marketing ploy, and the only thing that really annoys me about these amps. James Vanden Berg was the first person to point this flaw out and explain how to correct it.



Replacing the stock master volume with an audio-taper is the best way to fix the oversensitive Master—as we can clearly see by the example above. If I remember correctly, the log pot on 4 is equal to the linear pot on 0.5! For those who don't know, twelve on the log pot is also as loud as twelve on the linear pot. If you buy a logarithmic pot, and put it in yourself, it'll probably be the most inexpensive fix. Just don't try to install it yourself unless you're comfortable.

Linear and log pots can be identified by their casing. Log pots will have "A250KΩ" printed on the rear, while linear pots will have "B250KΩ." I've also seen a few that have "C250KΩ" on them, but I honestly don't know what the C stands for. It's probably a combination of A and B.

Unfortunately installing this yourself will void your warranty. In the case that it's already voided, I have to personally recommend this over the volume box. Once I replaced mine I ditched the Volume Box, as I no longer found it useful. Remember, replacing the pot won't make power amp saturation any easier to achieve.

You must use a *mini-pot* when replacing the Master control! The regular sized pots used in guitars are far too large. Trust me, been there done that. I personally prefer the 500KΩ log over the 250KΩ, the transition is just smoother and tweaking is VERY EASY. I've had absolutely no problem dialing in that "perfect spot" on the master since installing the 500KΩ. I got my pot from AllParts, part # EP 0186-000.

The only negative aspect of the 500K is that it's difficult to install—I'm actually quite embarrassed of the job I've done, but it works. Recently I've discovered that Antique

Electronic supply offers a 250K audio-taper pot exclusively for the Hot Rod Deluxe/Deville amps. This is the exact pot that Fender uses for the volume control of the clean channel. If we were to do a neat job one might not even be able to tell the amp was modded at all. So go to...

[Antique Electronic Supply](#)

and search for **R-VHD-250KA** in the search box at the top of the page.

If the 250KΩ doesn't have enough "tweakability" for you, then try the 500KΩ pot available from All Parts, but you'll need to make the proper mounting hardware yourself. Luckily, there are instructions located on [DIY Guitarist](#) for this.

To learn more about this mod be sure to check out its section in the [James Vanden Berg mods](#).

Attenuators

In my opinion an attenuator is the way to go for lower volume. You get all the preamp and poweramp saturation you could ever want, all the tube tone without the wall rattling decibel levels, your warranty is still intact, and it's safe on your amp.

It is imperative to understand, on the other hand, that an attenuator still doesn't mean an authentic "cranked" tone, since the signal is cut prior to the loudspeaker, and it plays a vital role in our live sound—especially if the speaker breaks up. So you'll never get a 100% authentic cranked tube amp sound without actually cranking it, sorry. Attenuators are about as close to cranked tone as you're going to get in your bedroom.

It should be noted that some attenuators are more transparent than others. The less expensive models, and even some expensive ones, tend to noticeably dull high end sparkle. My Weber Load Dump does this, but the ability to audition different power tubes in my dorm room more than makes up for it. (Note: Just because a set of tubes sounds good at home doesn't guarantee the same tone on stage, and using an attenuator allows us to observe how the tubes would sound at a gig.)

The main problem with attenuators is that they're out of some people's price range. Here are a few estimated street values.

Marshall Power Brake: est. US\$339.99
THD Hot Plate: est. US\$279.99
Weber MASS: est. US\$130.00
Weber Low Power Load Dump (50w): est. US\$75.00



If you can afford it, I highly recommend you try one.

Half-Power Switch

Also called a pentode/triode switch, running your power tubes (pentodes) as triodes successfully lowers their gain. The concept has been described as, "goofy at best" by techs, though some still ask about it. To understand exact how one works you'll need to understand what makes a diode a diode, a triode a triode, a tetrode a tetrode, and a pentode a pentode.

Pentodes, which are really just electrically improved triodes, run much more efficiently than real triodes do. This improvement in operation allows pentodes to get a much higher amplification factor than its predecessors. The screen grid is one of the electrodes that make the pentode so much more efficient than a triode. By connecting the screen grid to the plate, we can force our power tubes to run as triodes. Once disabled, the pentode suddenly doesn't have as much gain, hence a drop in perceived volume. Seems like a great idea huh? Well there's a few draw backs.

First, running your power tubes as triodes will cause an impedance mismatch. Second, interelectrode capacitance between the control grid and plate, which the screen grid prevented, begins to take place. You see, triodes aren't very good at amplifying high frequencies—that's why engineers added the screen grid. When you make a pentode run as a triode the result is poor high frequency response. Some people describe the sound as "warmer," some describe it as "muffled." It's really all a matter of personal taste. Still, putting one in yourself voids your warranty. I'm not sure if paying an authorized Fender tech to put one in would void it.

Putting in Lower Gain Preamp Tubes

This is one of the most popular, non-destructive mods for Hot Rods. The HRDx uses three dual-triode 12AX7s for its preamp section and phase inverter. The 12AX7 is considered to have an gain factor of 100%. Its sister triodes, the 12AT7 and 12AY7, have much lower gain factors and can be freely exchanged in place of the 12AX7s. If you have trouble understanding what that means then [click here](#). The Tube Store does a great job explaining this, and includes a neat interactive graphic to help you learn.

Replacing several preamp tubes with their lower gain counterparts will obviously have more of an effect on the volume than only replacing one. Many people describe the lower gain tubes as having more of a "bluesy" sound. Personally, I like the 12AT7 in V3 with 12AX7s in the other two spots. I know many people who don't like how this sounds in their HRD. All of it really depends on the speaker that's in your HRD, and the sound of the instrument being played. The most popular replacement seems to be a lower gain tube in V2, which is part of the Drive channel. To find out which tubes do what, check out my [preamp FAQ](#). To read more about the sonic differences between tubes check out [KCA NOS Tubes](#) and [The Tube Store](#).

Using an EL84 Adapter

There are a few adapters on the market that allow us to swap our 8-pin power tubes for *lower gain* British EL84s, which have 9 pins. The most commercially popular adapters are THD Yellow Jackets, Jester Black Jacks, and Ruby Tubes' Tone Bones (respectively). All convert your amp from Class AB to "Class A," and because they incorporate cathode bias, you do NOT need to rebias. (Note: I do not know if the amp is converted to *true* Class A, but I seriously doubt it.) Installation takes only a few minutes, and involves pulling the old tubes and replacing them with the adapter. Most companies include a set of EL84s with purchase of their adapter.

What about the sound? At home most guitarists think their amp sounds just as loud as it did with 6L6s. The fact is you probably won't find that drastic of a difference until you're in a band situation, like practice or a gig. So expect a 3dB deviation. (Be sure to take this into consideration, because this might be the opposite of what some people are looking for.) Consider the 6L6's low end thump swapped for the EL84's richer, crunchier, and more compressed overdrive—less roundness for more bite. The compressed feeling will only become more pronounced as the amp is turned louder, and the amp will just "feel" different. The change in volume doesn't seem to take place until the clean channel is turned passed 4 or 5 on the dial. At 3 or 4 the HRDx sounds pretty loud and clean, but any further and the tubes will begin to overdrive. Many guitarists admit the change sounds good, but some confess that it "gets old after a while." Gone is the big clean bottom of the 6L6s, often times the reason they bought the amp.

If you'd like to experiment with a different flavor of sound, but don't want to buy a whole new amp, an EL84 adapter just might be what you're looking for. Expect to pay around US\$100, just be sure to get the adapter that's designed for 6L6 replacement.

Pulling a Tube for Lower Volume

This has been asked so I'm including it here. It's possible to pull a power tube out of your HRD, but I'll save you some time and tell you that it will sound terrible and won't lower the volume. You can only pull power tubes when they're in multiple pairs. For instance, if you have two pairs of power tubes (a total of four), then you could pull a pair and only run the amp on two. There are some drawbacks to this like throwing the impedance off, but it can be done. Whether this is unhealthy for your amp or not is a matter of opinion between the experts. (I'm definitely not one of them. Sorry.) Pulling one power tube, out of a pair, will absolutely result in nasty crossover distortion. Try it if you want. Assuming nothing breaks I can guarantee that you won't like it.

What about pulling a preamp tube? If you do this, chances are your amp simply won't work. All the preamp circuits are coupled together, and while I haven't tried it, removing a preamp tube will most likely result in no output at all.

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By Justin Holton