Get Loud Training

Ampeg 201

Schedule:
7.5 minutes- Ampeg 101 Recap

15 minutes- How audio works and signal flow

15 minutes- The speaker/cabinet/math part

7.5 minutes- Tubes!

15 minutes- Bringing it all together and real life applications

Our Goal: *To gain a better understanding of the 'nuts an bolts' of a bass system, including signal flow and some basic troubleshooting. We will also dig deeper into some features found on bass amplifiers, and some tips on how to be a bass player in the real world.*

Ampeg 101 Recap

In our previous installment we learned a little bit about the birth of Ampeg and the man behind it, Mr. Everett Hull, who started the company in 1949 and named it after his "Amplified Peg", which contrary to some myths was not named after a hopped up version of his Aunt Margaret, but a microphone built for use in a stand-up bass.

We also learned about types of amps the basic things needed to hook up an amp, and some of the ins and outs and amp controls. Today we're going to get a bit more into the nuts and bolts of how these things work.

In the first Ampeg class, the different amp systems were discussed: Combo amps- a self-contained system with the speaker built in, and the Head/Cabinet setup, where separate components make up your rig. We also discussed four common types of amplifiers,

-Tube (SVT-CL, SVT-VR, B-15, V4B)
Uses Vacuum tubes in the full signal path. Can be characterized by warmth and a smooth, overdriven tone. Tube amplifiers **must** have load (speaker) attached.

-Solid State (BA series, Micro Series)
Uses transistors instead of tubes for the gain stages and amplification. With Solid

State output sections you can get very high power outputs compared to tube amps.

-Hybrid (SVT-4Pro, SVT-3Pro)
These use a tube in the preamp section for added warmth and compression, with a Solid State output section for high power.

-Class “D” (SVT -7Pro***, PF series)
Lightweight, efficient, high power. Class D amps use a smaller transformer to make amp lighter. Output transistors are either fully on or fully off, therefore wasting less energy. Class D amps use Pulse Width Modulation with the input signal in conjunction w/ a comparator to make this happen. These can be up to around 90% efficient (class AB is around 78.5% at best, typically 50%).

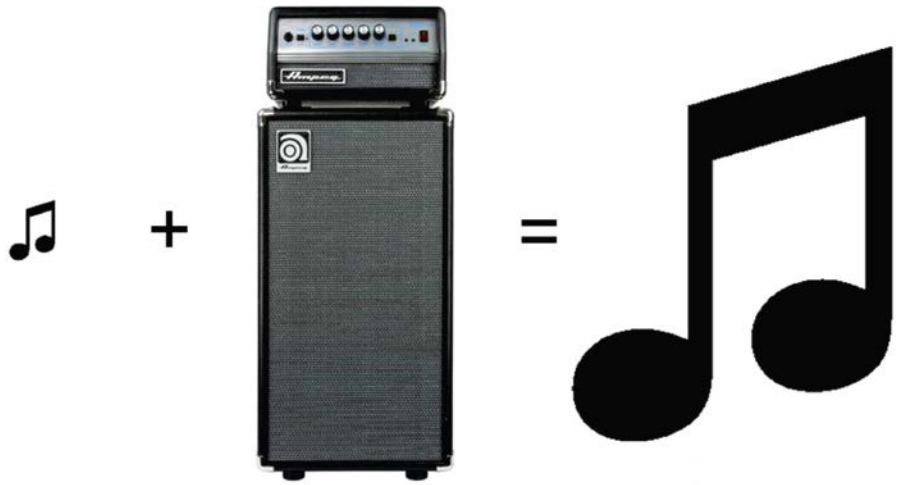
***The SVT-7Pro is essentially a hybrid amp, with a tube in the preamp, with a Class D power section.

All of these types can be found in both heads and combos.

The Big Question: What does an Amplifier do?

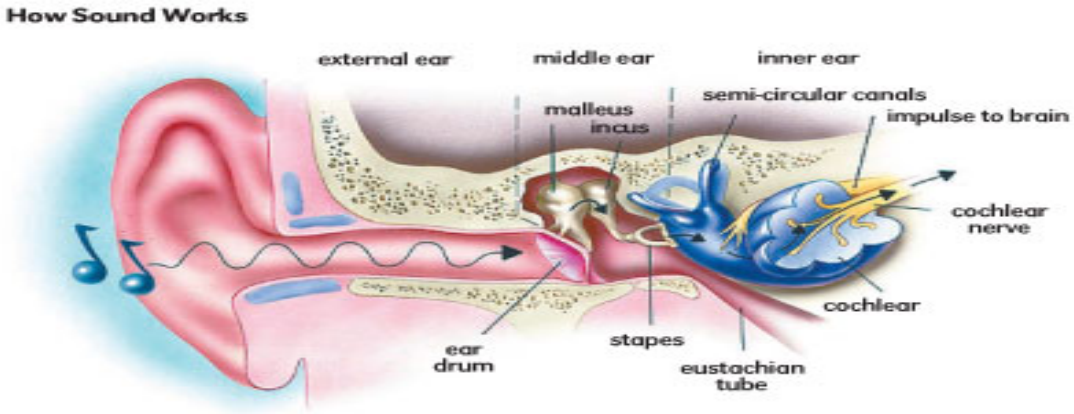
It AMPLIFIES! It takes a small sound and makes it bigger, so you can compete with your drummer who never learned the subtleties of dynamics and your guitar player with his Yngwie Malmsteen Marshall Mega stacks.

Get Loud Training



NOT SHOWN ACTUAL SIZE

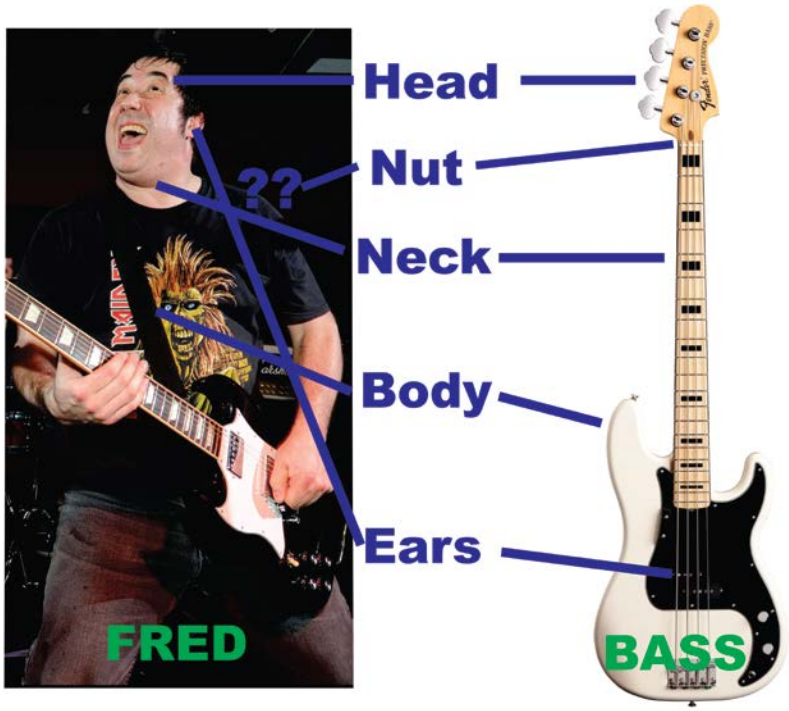
And to better understand how an amplifier amplifies- in this case sound- we need to be able to understand how sound works. Sound is produced when an object vibrates, moving the air particles around it. Those air particles then move the air particles around them, carrying the pulse of the vibration through the air as a traveling disturbance.[i] In this way a vibrating object sends a wave of pressure fluctuations through the atmosphere. Inside your ear is a thin piece of skin, called the eardrum. When these vibrating air particles reach your eardrum, your eardrum in turn vibrates, sending microscopic pulses which your brain interprets as sound.



We can make our own amplifier just using the human body. Let's get a volunteer. If we whisper something into our volunteer's ear, and they repeat it, loudly- Wow! We just took sound vibrations (the whispering), sent those sound vibrations into an external device (our volunteer)

where the vibrations were changed into electrical pulses and interpreted, then changed the tone and level of the information and spat it back out as MORE sound vibrations!

We can use this concept of how we hear and apply it to a bass amplification system. Now, let's personify our setup. We will call our bass "Fred", named after a fantastic guitar playing friend of mine, who's name, coincidentally, is Fred. "Hi, Fred."



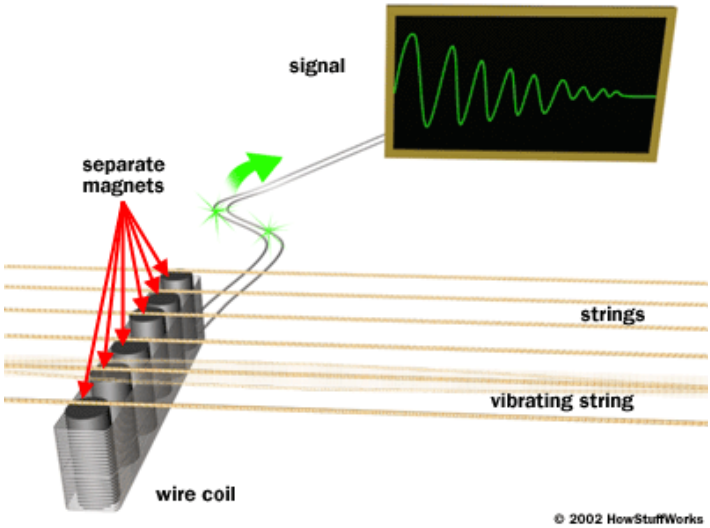
Fred here is similar to a person in a lot of ways. He has a head (or head stock), he has a neck- a nice long giraffe-y neck, he has a body, and down here we have Fred's 'ears'. Don't ask me why Fred's ears are down here. And don't ask me why his nut is at the top of his neck. Fred's 'ears' are known as pickups, which adequately enough "pick up" the vibrations of the strings, converting the vibrations into electrical current, like what happens in your brain. This electric current then travels out of the bass, through the cable, and into the amplifier head (The Brain!). Within the head, the signal is interpreted, the tone is changed, the level is boosted, then it is sent to the speakers and Voila! The thunder has been brought.

In the first Ampeg class, the different amp systems were discussed- Combo amps, which have the speaker built in, and the head/cabinet setup, where separate components make up your rig.

Get Loud Training

Signal Flow

Let's go back to the front. Fred's pickups consist of a magnet wrapped with a coil of several thousand turns of copper wire. The magnet creates a magnetic field. The motion of the vibrating strings disturbs the magnetic field and the changing magnetic flux (flux means 'flow') creating a voltage in the coil. So you have a vibration transformed into a voltage- specifically an AC voltage. This voltage is quite small- typically around 100mV to 1V peak-to-peak. Some basses include a built-in preamp, and if you were paying attention during the first class, you know that these are called 'Active' basses, which will have a slightly higher output voltage because the signal has already been put through a gain stage.



This signal is then carried through our cable into the Amplifier's input jack.
Now that the signal is inside the amplifier, what happens? For simplicity's sake, there are two distinct sections of an amplifier- The Preamp and the Power Amp. The first section is the Preamp.
Preamps: The Preamp does two things: The gain is increased, and the tone is changed. Preamp circuitry can be either tube or solid state.

Gain just means the amount your signal level is increased, whether by using tubes or solid-state devices (transistors). Most amps will have several gain stages. Some preamps have a gain control, while others have a fixed amount of gain. Either way, they usually have a "volume" knob which just passively increases or decreases the overall signal level at the very end of the preamp circuit.

Tone can be defined as anything from EQ controls, to "warmth" or other subtle qualities, to outright distortion. Ampeg bass amps use a Baxandall- type equalization, invented by a fine English gentleman named Peter Baxandall. In many of our older amps, there were only two controls- Bass and Treble. The midrange was able to be boosted by cutting the highs and lows. These principals were expanded on, and you have our modern EQ setup that gives you astonishing control of the frequency spectrum. Astonishing amounts of control is not enough for you, you say? Most Ampeg EQ sections also include a Midrange Frequency select switch (also known as a 'style' switch that changes the frequency that is boosted or cut by the midrange control. For example, on the SVT-CL, those frequencies are as follows: 220Hz, 450Hz, 800Hz, 1.6kHz, and 3kHz. Fascinating, Right?
As if that wasn't enough, many models have Ultra High and Ultra Low switches. The

SVT-3Pro and 4Pro even have a graphic EQ which allow you to tweak individual frequencies to your little heart's content.

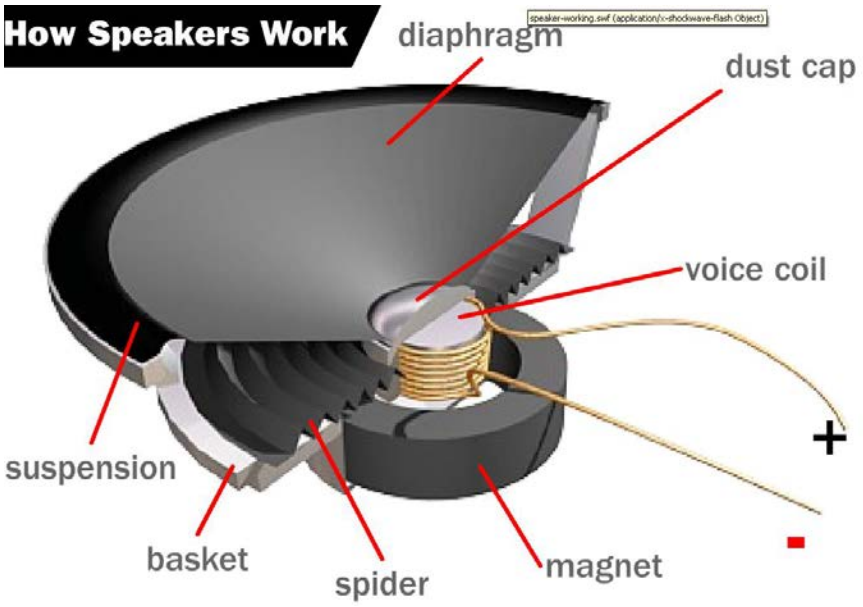
Figure 37c: Typical Simple Ampeg Tone section

Power Amp: After all of the gain stages and tone-shaping of the preamp section, the signal is now at a usable enough level to be sent onto the Power Section. This is the part of the amp where you take a little baby lizard, add some nuclear radiation and end up with Godzilla. The audio signal is still very small, with not enough juice to drive a speaker. So this section simple takes that little signal and makes it bigger- something that a speaker can use. These gain stages can be either tube or solid state (transistors).
A quick aside here: Types of amplifiers are broken up into "Operating Classes", the most common in audio being Class A, Class B, Class AB, and Class D. Ampeg uses primarily Class AB and Class D amps.

Speakers: Finally, after all of the vibrating, the pre-amping, the tone-shaping, and amplifying, we need to take the audio signal (which at this point is still just electrical current) and make it audible to the human ear. And for this purpose, we have something that most everyone is familiar with- The Speaker, or driver.

Components of a speaker:
The Diaphragm, or Cone- usually made of paper, plastic or metal, is what vibrates to create sound waves. This is attached to-
The Suspension, or surround- a rim of flexible material that allows the cone to move. This is attached to-
The Basket- which is the driver's metal frame.
The Spider- another rim of flexible material that holds the voice coil in position, but allows it to move freely.
The Voice Coil- connects to the narrow end of the cone. The voice coil is a basic electromagnet- see how we've come full circle here?

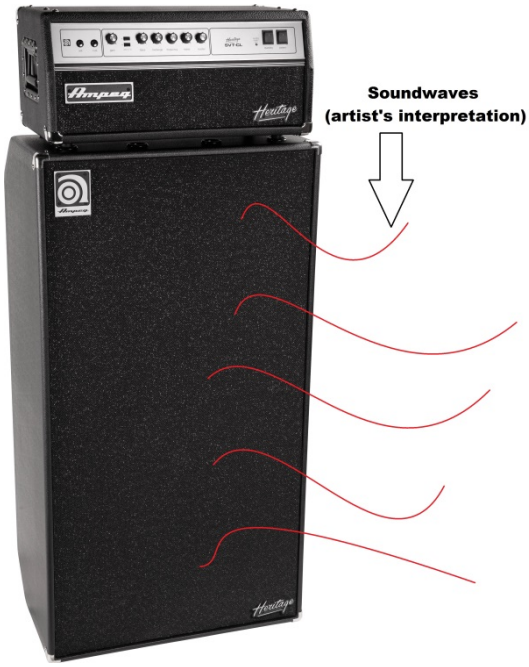
Get Loud Training



When the electrical current from the output of the amplifier flowing through the Voice Coil changes direction, the coil's polar orientation reverses. Sounds a lot like Alternating Current, doesn't it? The Voice Coil moves, causing the diaphragm to vibrate, producing –yup, you got it- Sound Waves!

Essentially, the amplifier is constantly switching the electrical signal, fluctuating between a positive charge and a negative charge on the red wire. Since electrons always flow in the same direction between positively charged particles and negatively charged particles, the current going through the speaker moves one way and then reverses and flows the other way. This **alternating current** causes the polar orientation of the electromagnet to reverse itself many times a second When the electrical current flowing through the voice coil changes direction, the coil's polar orientation reverses. This changes the magnetic forces between the voice coil and the permanent magnet, moving the coil and attached diaphragm back and forth..[ii]

Get Loud Training



NOT ALL SPEAKERS ARE CREATED EQUAL

There are three main specifications that we concern ourselves with when dealing with speakers: The size, the impedance, the power handling.

Size

Speakers come in all shapes and sizes. The most common shape? Round.
In the world of Ampeg, our speakers come in 8", 10", 12", and the always popular 15".
Generally speaking, lower frequencies are accentuated as the speaker size increases.

Impedance

Electronically 'speaking', speakers are considered a 'load'.). Impedance (Z) is how much a device resists the flow of an AC signal, such as audio. Impedance is similar to resistance (R), which is how much a device resists the flow of a DC signal. Both impedance and resistance are measured in Ohms. As we know from the previous section, we're dealing with Alternating Current, so we will be speaking about Impedance. A novice may use the term "Ohmage". "Ohmage" is not a word, and using it does not impress the cool kids.

- The following equations help you match the impedance of speakers to amplifiers for optimized performance (avoiding overloads and other issues)

- Impedance in Series:

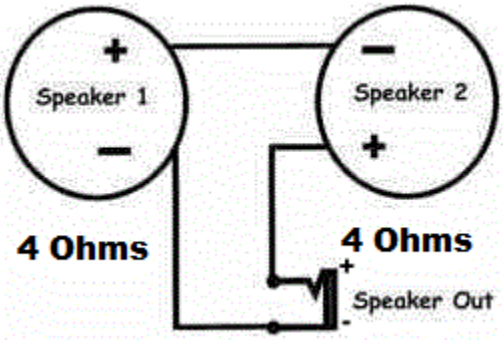
I'm mentioning Series Impedance as a detail (and the formula is simple). The speakers in many of our cabinets are wired in Series/Parallel. Think of Series as a Choo-Choo Train. The Engine is like the head, and it pulls the combined Impedance of train cars behind it.

Z = Impedance (the resistance of your speaker in ohms)

T = Total Impedance

THE FORMULA: ZT = Z1 + Z2 + Z3 etc….

If we have 2 speakers, each with a 4 Ohm rating, using the above equation for our example gives: 4+4= 8, RT = 8 Ohms



So, in this case 8 Ohms of resistance is presented to the amp, or in other words, the output current of the amp would meet with 8 Ohms of load resistance.

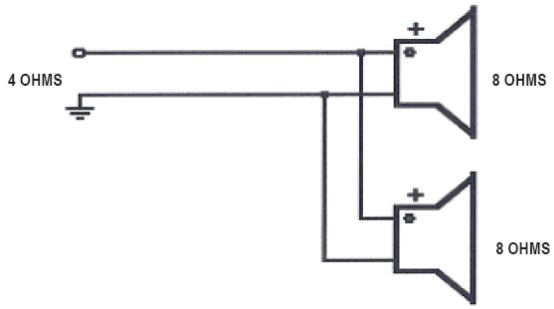
Impedance in Parallel:

If we look at the real world applications of hooking up cabinets, we will find that most cabinets are wired in parallel, so we have to use the following formula:

1/ZT = 1/Z1 + 1/Z2 + 1/Z3 + etc.

The more cabinets you add, the lower the Impedance becomes.

Get Loud Training



TWO 8 OHM SPEAKERS WIRED IN PARALLEL

Here we have two 8 ohm speakers in parallel, giving us a total impedance of 4 ohms.

THESE SAME THEORIES APPLY TO SPEAKER ENCLOSURES!

To keep life as simple as possible, most people put enclosures of the same impedance in a parallel circuit. If you do this it's all just a matter of dividing that impedance by the number of speakers. If you connect speakers of different impedances, the power output will be greater to some, less to others, which means some will be louder than others. (In higher tech circles, we commonly refer to this condition as "very not good").[iii]

To reiterate; More power will flow through a speaker with less impedance than one with a higher impedance- this can put a higher strain on the amplifier to try to produce this power. This is why we don't like to mix impedances.

Quiz Time!! (This isn't really a quiz, since the answers are right in front of you)

Which of the following head/speaker setups is recommended and why?
Discuss amongst yourselves

Get Loud Training

Keep in mind that like much of life, these are just guidelines (Except for tube amps, which are much more finicky about their load's impedance than Solid State amps).

Power Handling

The spec for power handling is simply "how much wattage, or power the speaker will handle". What does this mean in the real world? Not much. It's a guideline.

Power handling specs, typically stated as "up to xxx watts," but the spec is really pretty useless. For example, it implies that you'd be living dangerously if you hooked up a 200-watt-per-channel amplifier to a speaker rated for 100 watts. Not so! In fact, you'd be more likely to harm said speaker with a 50-watt-per-channel receiver, it you played it loud. Why's that? Because the 50-watter would be way more likely to clip (distort) when playing loud than the 200 watt amp.

The lower power receiver's distortion is way more likely to "blow" a driver. Yes, if you went nuts with the 200-watt beast it would also cause damage, but at a much higher volume level than the 50 watt receiver. Either way, a little common sense restraint will save the cost of repairs, but the point here is the power handling spec doesn't provide any real guidance. Ignore it. Hint: If you want to play loud, even if only now and then, buy bigger speakers and more powerful electronics.[iv]

One final equation: $PT = P1 + P2 + P3$

where P is Power. The more cabinets that you add, then the greater the power handling. If you have, for example, a PF-115HE that has a power handling of 450 Watts and has an 8 ohm impedance and add a PF-410HLF that has a power handling of 800 watts with an 8 ohm impedance, your total power handling is 1250 watts. Bonus question: What is the total load when you put these speakers together?

Get Loud Training

For an amplifier to operate with the greatest efficiency, you should match up the suggested impedance, and make sure that your speakers have a great enough power handling to withstand the amp's output power. Handily enough, these numbers are written right on the back of the amp and cabinet (and in the manual; always consult your manual).

-Handy Tips for Matching Amps to Cabinets

Now that you've gone through all of the above Gobbledygook, you may be saying "That's all great, but what does it mean?" It means this:

- First off, USE YOUR EARS! If the sound is distorting, or farting out, BACK OFF YOUR GAIN AND VOLUME!
- The power ratings on the back of your amp and cabinets are guidelines. You don't need to live your life by them, but pay attention to them, at least. For example, you wouldn't want to match the 1000 watt SVT-7Pro to the 200 watt SVT-210AV and expect amazing results. Common sense, people!
- Some people talk about "under-powering" a cabinet. This is not possible, because math.
- Match your cabinet with your amplifier. If using two cabinets, get ones that have matching impedance. A Solid State Amp is more forgiving in regards to its load than a tube amp. A tube amp MUST have a load connected. More about this in a bit.
- Daisy-chaining cabinets: Most of our cabinets have two or more jacks on the back. These can be used to hook up another cabinet in parallel. Is it an input or an output? The answer is yes.

TUBES

A Tube (or electron tube, or vacuum tube, or valve, or lamp) is a device that controls electric current through a vacuum in a sealed (usually glass) container. Tubes are high impedance, high voltage

but low current devices. To get up in the higher output wattage ranges, you need to increase the voltage at which the amp operates.

Currently, most tubes are manufactured in Russia (JJ, Sotek, Tung-Sol, Electro-Harmonix) and China.

People are always asking 'What is the best tube to put into my amp? The fact is: Tung-Sol, Mullard, Electro Harmonix- all built in the same factory. JJ and Telefunken? Built in the same factory. Do a little research, figure out what characteristics you're looking for and purchase appropriately. Tone is in your head.

Here are some of the various tube types that you may see:

Rectifier Tube- Converts AC to DC (B-15)

Preamp Tubes- First in signal path, increases low level signal from bass (12AX7 most common).

Phase Inverter- Basically splits the signal in a typical AB class (push-pull circuit) amp and feeds the power tubes with the original signal and a phase-inverted signal.

Driver- Boosts the signal being fed to the Output tubes.

Power (Output) Tubes- Where the super mega amplification occurs.

As I stated before, a tube amp MUST have a load attached (a solid state amp doesn't care if there is a load attached or not). On top of that, your load MUST match the impedance that the head is looking for. Why is this? A tube amp has an output transformer between the tubes and the speaker jacks. This transformer has taps for certain output impedances, the most common being 16, 8, 4, and 2 ohms. The impedance at the output of the power tubes is very high, and the transformer is 'Transforming' that impedance into something to match the speakers- essentially "Stepping Down" by a certain ratio. If a mismatched load is attached, excessive strain can be caused to the Output transformer, and in turn, the Power tubes. Not the cheapest fix! Fun fact- much of the weight of a tube amp comes from the Output and Power transformers.

Bias

When dealing with tube amps, you need to be aware of amp Biasing. What is biasing? Biasing is the optimization of current flow at idle. What the heck is that supposed to mean? It just

means that the tube's current draw needs to be adjusted for maximum efficiency (there's that word again!). Many lower wattage tube amps (and some higher power amps) have a fixed bias point or are self-biasing (like many Mesa Boogie models). Higher wattage tube amps like the V-4B, SVT-VR and SVT-CL need to be biased for them to be all that they can be.
You can look at it like adjusting the carburetor on a car (when cars still had carburetors) – you had to adjust it so there was a proper mixture of air and fuel so that your engine would run as smoothly as possible. In a tube amp's case you are adjusting for optimum current flow.

On most amps, you either need to have a tech do your biasing for you, or if you're really handy you can learn to do it yourself. It's not rocket surgery, but unless you have experience in electronics I don't recommend doing it yourself. Hundreds of volts flow through an amplifier, one misstep and you could look like this:

On the SVT-CL, though, it's easy. You should start with a matched set of tubes- since by their nature they tend to vary quite wildly in terms of operating characteristics, it is recommended that you replace your power tubes in matched sets; ones that have been graded by the tube factory on the basis of similar qualities. In keeping with the car analogies, your car has four tires (and a spare, if you're lucky). What happens when you get a flat and you put that little donut spare on there? You can't go over 40 mph, your steering is jacked, etc. Same concept here. If you have a tube that doesn't match the rest, the others have to compensate, conceivably shortening the life of your tubes. And power tubes are not cheap- starting at around $180 for a sextet .

Get Loud Training

Setting Tube Bias

Turn the power on and allow the unit to sit in 'Standby' for 3-5 minutes (after following all normal setup requirements). Next, take the unit out of 'Standby' and do a quick check of the Bias LEDs on each control. Both LEDs should be lit green. If not, turn the Bias controls until the LEDs are lit green. If this seems impossible, please refer to the chart on the next page for possible fault conditions. Now is a good time to check for any unusual sounds and possible glowing from the Power Tubes (see 'Changing the Tubes' section listed above).

At this time, play your bass for at least 20 minutes to allow the unit to warm up at proper AC line voltage. You may notice that the Bias LEDs illuminate red while playing. This is normal.

Next, turn down all controls on your bass and set it aside, leaving all amp controls alone. With no input signal present, adjust each Bias control so that only the associated green LED is illuminated. The controls may be slightly interactive, as they do affect each other.

So where does one set the Bias? If neither LED is lit, the amp is over-biased (counter-clockwise). This will result in some distortion in the power amp and a generally thin sound. If the green and red LEDs are lit, the amp is under-biased (clockwise) and too much current is flowing to the power tubes. This will result in a big, full sound, but will also reduce the life of the power tubes. For the longest tube life, but poorer tone, set each Bias to JUST AS the green LED illuminates. For shorter tube life, but better tone, set each Bias to JUST BEFORE the red LED illuminates.

Once set, the controls should not have to be changed except as needed for tube replacement, or to compensate for tube aging. Note that the AC line voltage may vary from place to place and the LEDs will vary slightly. This is normal.

The Bias 1 control adjusts the three left (front left, rear left and rear center) power tubes. The Bias 2 control adjusts the three right (front right, rear right, and front center) power tubes. By observing the LEDs as the Bias controls are slowly rotated clockwise, a number of tube problems may be diagnosed by the user as seen in the table below.

Condition	Problem	Solution
Green comes on, then red	No problem	The longer the green LED is on before the red LED comes on, the better matched the tubes are.
Red comes on, then green	Tubes not properly matched	Set slightly before green comes on, obtain matched tubes when possible.
Red comes on, no green	One or more tubes are non-functioning	Check to make sure tubes are all seated properly; if so, find and replace bad tube(s).
None on	Possibly no high voltage or bad Bias Control or bad tube(s)	Have unit checked by a service technician.
Both on all the time	Possible bad Bias Control or bad tubes	Have unit checked by a service technician.

If the tubes are bad enough to cause damage to the unit, the Fault Indicator (#11, Front Panel) will signal and the unit will shut down.

If your amp is biased too cold, your tone can sound weak and anemic. Maybe that's your thing. It's not my thing, but maybe you like to just hide behind the accordion player.
If you bias your amp too hot, then you're going to shorten the life of your tubes, which as I mentioned, can run from expensive to extremely expensive.
I will also mention here that while the SVT-3Pro and SVT-4Pro have MOSFET (solid state) output sections, they also have a bias adjustment that works on the same principals of adjusting for the best amount of current draw.

Advanced Input and Output

Let's take a look at some additional fun things we can do using the various inputs and outputs of Ampeg amplifiers.

Adding External Effects

You've got some options when you want to add some extra mustard to your sound via outboard effects.

- Plug in between your bass and the amp.
  This is probably the most common and easiest way to hook up effects.
  Bass→ Effects→ Amp. Easy!

- Use the Effects Loop (if equipped)
  From the EFFECTS (or FX) SEND jack, you can send a line-level output to the input of an external effect. From the output of the effect, you would return the processed signal to the amp via the EFFECTS RETURN jack.
  Bass→ Amp. EFFECT SEND jack→ FX input. FX output→ EFFECTS RETURN jack
- Use the Preamp out/ Power amp in jacks (if equipped)
  Bass→ Amp. PREAMP OUT jack→ FX input. FX output→ POWER AMP IN jack

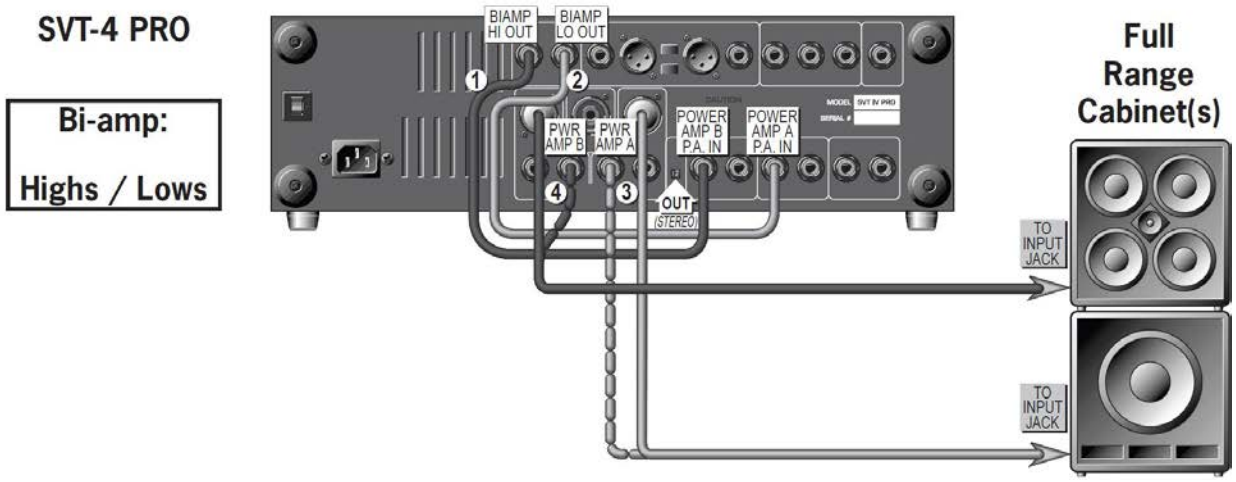
<u>Using the Preamp Out Jack</u>

The Preamp out jack can be used to send a line-level signal to another power amp, a recording console, or a live soundboard. Use a shielded cable!
In much the same manner, you can use the SLAVE OUT jack (as seen on the SVT-CL and SVT-VR. Use this jack if you want to use the preamp of one amplifier to control the output section of a second amplifier. Take your cable from amp #1 and plug into…

-The POWER AMP IN jack on amp #2. This jack connects directly to the internal power amp for use with an external preamp. The internal signal is usually disconnected when a plug is inserted into this jack.

Bi-amping

Essentially, bi-amping is when you split the high and low frequencies of an amp and send them to different speakers. Ampeg's SVT-4Pro is our only current amp that employs biamping features. With two separate amplifiers we are able to power one set of cabinets to handle the high frequencies, and one set of cabinets to handle the lows. The point at which the frequencies are split (called the Crossover point) is controlled by the Frequency knob on the front of the SVT-4Pro. You can also control the relative level of the signals.



Being a bass player in Real Life

Now that we have all of this semi-useless information, we have all of the tools to be a bass player in the real world!

Not quite. You might want to sit at home and practice first. In doing so, you will hopefully begin to develop your own musical identity. This can take years. It comes from the music we listen to, the music we play, and the people that we play with.

We are a product of our influences. A new bassist really knows nothing of tone, or style, but will take the songs they like, and the kind of music they like and start learning to play through mimicry. Somehow, over the course of many, many years, you will develop your own style (if you're lucky). Tone is in your head. Tone is in your hands. Don't imagine for a second that all

you need to do is plug into a $1500 bass head and an 8x10 and you'll magically sound amazing. If you handed Jaco Pastorius any bass, and plugged him into any amp, it would still sound like Jaco. Steve Harris sounds like Steve Harris. Use your influences. There are no rules. But there are most certainly guidelines! The best advice I can think of is this: Learn from those who have come before you. And speaking of those who came before you, as you are on your quest for a certain style and tone, the friendly manual writers at Ampeg have included some sample tone settings for you. These settings can be applied to any one of our amplifiers, but in the examples below, we're using an SVT-4Pro and SVT-CL.

Setting 1 - Classic Ampeg

Setting 2 - Funky Thing

Setting 3 - Ethereal Fretless

Setting 4 - "Jaco"

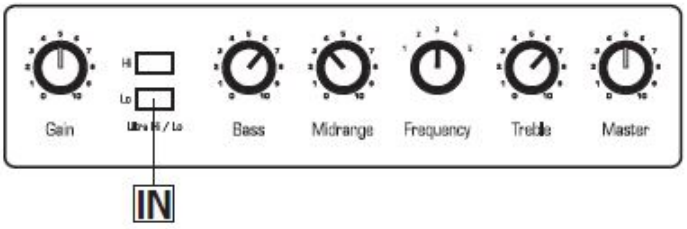
Setting 5 - R&B Groove

Setting 6 - Downright Upright Done Right

Get Loud Training

Some Suggested Settings

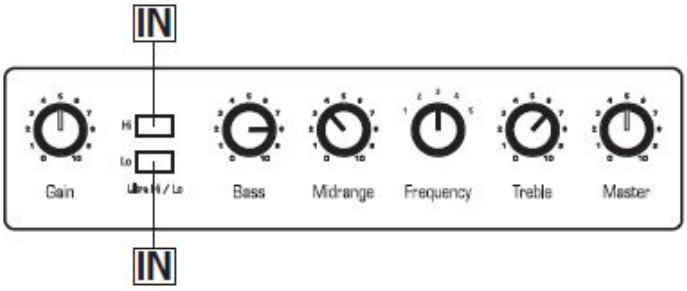
JAZZ:



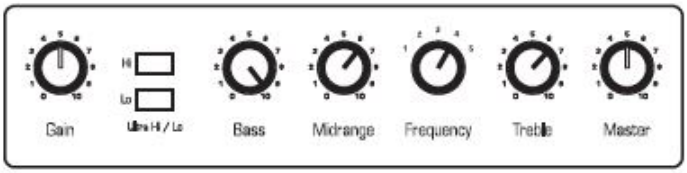
The setting of the Gain control depends on your particular instrument.

The Master should be set to produce the appropriate output volume level.

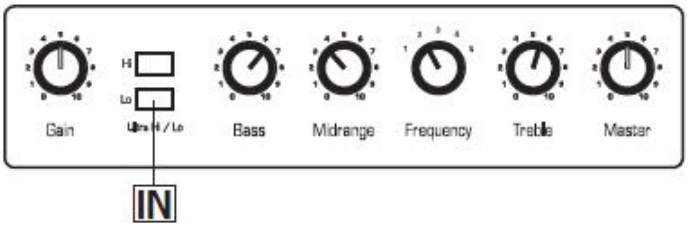
FUNK:



ROCK:



COUNTRY:



Get Loud Training

Being a bass player in a studio

- Be on time.
- Be prepared. You are on someone else's time and spending a lot of dimes.
- If you're gonna have fresh strings, change them the night before the session to give them time to stretch.
- The engineer will often take a few different signals from your bass-

  -Microphone: Using a microphone to capture the sound from your cabinet is easy to do but subjectively difficult to perfect. A microphone will sound differently depending on how far away it is from the speaker, where it is in relation to the speaker's cone, and what kind of microphone it is.
  Here are some common microphones used for bass recording:

  - AKG D-112
  - Shure SM57
  - Shure Beta 52
  - Audix D6

  -DI OUT (from your amp): Typically, you would connect this balanced output to the balanced input of an external mixer, or a recorder. In this way, you do not have to mic the speaker cabinet in order to add it to the main mix, or to record. The output is not affected by the master control.

  -Standalone DI: If you have no DI OUT on your amplifier you can purchase a standalone DI box to achieve the same result. There are a bunch of them out there, ranging in price and features- some that will color your tone, some that just spit out a clean signal.

  Your final sound will usually be a mix of all of these signals, depending on what you're going for, but for the most part an engineer will want at least one clean, pristine track to work with- with the option of adding to it during mix down, whether adding effects or re-amping, or running through amp emulation software. With DAW recording it's easy to mix and match all of the signals and cobble together one good bass track out of several takes.

  Below is a picture of a thrown together recording setup. In this situation we have 2 microphones (a cheap CAD kick drum mic and an SM57) on an SVT-610HLF, which is being driven by an Ampeg Heritage SVT-CL. We're taking 2 lines out of the Direct Box (a Sansamp VT Bass)- one that is the unaffected signal direct from the bass, and the signal processed from the DI (which sounds REALLY

good). If I wanted to get crazy, I could take an effected signal from the Boss Effects Processor, and another direct line from the back of the bass head. Keep in mind this is kind of an extreme example.

Being a bass player on a stage

- Be on time.
- Be prepared.
- Buy a tuner that will mute your amp's output!! Nobody wants to hear you tune. Nobody.
- Learn to sing. You don't need to be Pavarotti, just be able to hit some harmonies. A mediocre bassist with good backing vocals almost always gets the gig before an amazing bassist that sounds like a wounded wharf seal.
- Buy Strap Locks. While it's funny to watch a bass plummet to the ground and snap the neck off, it's NEVER funny when it's your bass.

- ALWAYS pack extra cables, picks, straps, etc. If you don't need it, someone else inevitably will.
- If possible bring a back-up head or your own DI to get you through the gig, because bad things happen whenever they want to. There are a ton of cheap Class D amps out there- pick yourself up a nice PF-350 and throw it in your gig bag just in case.
- The sound engineer is going to either put a mic on your cabinet, run a DI box (which stands for 'Direct Injection', or take a line directly out of your amp- or any combination of the above.
- Listen to your sound engineer. They (in many cases) know the sound of the room. If they ask you to turn down (which they will 95% of the time), do it! They aren't messing with you, they are trying to make your band sound good.
- Don't be drunk/high. Unless that's part of your shtick.
- When playing with other bands, get your gear on and off the stage quickly. If I see you standing around after your set talking to your 'fans' instead of moving gear, and I'm playing after you, I will 'motivate' you to hurry up. Be warned.
- Nobody cares about your tone except for you and MAYBE your guitar player. 98% of the audience doesn't care about the bass player anyway, unless you are also the singer or Billy Sheehan.
- Prancing around on stage is cute until you trip and fall into the drum set. Then it's hilarious.
- It's called Show Business for a reason.
- Play with people you like, unless the money is really good.

Basic Troubleshooting

- **No Power:** Is it plugged in? Is it on? Is the power cord plugged into the wall? Does the wall outlet have AC coming from it? Well, DOES IT?

If you answered 'Yes' to all of these questions, you might want to check your fuse. If your fuse is blown, you've got bigger problems. Get your amp to a tech.

- **No Sound:** Check your cables. Instrument cables, speaker cables,. Try different cables if you have them. Try a different bass if you have one.

The first thing you want to do when troubleshooting your bass rig is to eliminate everything that is not essential. Bass, instrument cable, Head (or Combo), speaker cable, cabinet. Skip your pedal board, get to the bare bones.

Still no sound? Let's figure out exactly which part of the system is causing us trouble.

- If you have a headphone jack, plug in some headphones. If you've got sound there, then the issue is in the power amp or speakers. Go see a tech.
- If you don't have a headphone jack, you can run a signal from the preamp out to another source. Same deal- if your signal is good at the preamp output, your problem is in the output section. Go see a tech.
- Plug your bass directly into the Power Amp in jack, if equipped. Make sure you turn down the volume on your bass first, or be prepared to spend some time locating a clean pair of pants. If you get a good strong sound here, your issue lies in the preamp section. Go see a tech.
- **Bad Sound:** Check your cables. Try a different bass. Are you starting to see a pattern here? Check your tubes, if applicable. Go see a tech.

Ampeg Nomenclature, or What do those numbers and letters mean?

Ampeg's naming system was not made to be all tricky, the name tells you what you've got. Here is a quick lesson in Ampeg nomenclature:

- SVT- Super Vacuum Tube
- CL- Classic
- VR- Vintage Reissue
- AV- Anniversary (essentially the same as the 'regular' editions, with sparkly silver grill cloth)
- H- Heritage (essentially the same as the 'regular' editions, with black sparkly grille cloth. Assembled in America!)
- V-Valve (or Vacuum tube, depending on who you ask)
- B- Bass
- E- Enclosure
- EN- Enclosure
- N- New
- H- Horn
- LF- Low frequency (Ported!)
- PF- Porta Flex
  PN- Pro Neo (lightweight Neodymium speakers)
- BA- Bass Amp
- 1- 1 speaker
- 2- 2 speakers

- 4- 4 speakers
- 6- 6 speakers
- 8- 8 speakers
- 08-8" speaker
- 10- 10" speaker
- 12- 12" speaker
- 15-15" speaker

[i] From "How Speakers Work" by Tom Harris, from electronics.howstuffworks.com/speaker1.htm

References

[ii] From "How Speakers Work" by Tom Harris, from electronics.howstuffworks.com/speaker1.htm
[iii] From Wikipedia "http://en.wikipedia.org/wiki/Ohm's_law"
[iv] http://www.cnet.com/news/speaker-specifications-a-buyers-guide/ by Steve Guttenberg

Photo credits

All 'nice' Ampeg product photos c/o Ampeg (pages 3, 5, 6, 7, 9, 11, 12, 19, 20-22)
All 'crappy' Ampeg photos c/o Hodgy (pages 14, 17, 19, 24)
Page 2; Marshall wall c/o http://www.spytunes.com/gear-review/marshall-amps
Page 4; Ear picture c/o http://www.familyhealthonline.ca/fho/childhood/CH_earache_FHa10.asp
Page 4; Fred pic c/o Fred Speakman, photo by Keith Johnson
Page 4; Fender P-bass pic c/o www.fender.com
Page 6; Magnets- how do they work? c/o http://entertainment.howstuffworks.com/electric-guitar1.htm
Page 8; Speaker diagram c/o http://electronics.howstuffworks.com/speaker5.htm (authored by Tom Harris)
Page 10; Series speakers c/o www.usspeaker.com
Page 11; Parallel speakers c/o www.hometoys.com
Page 15; Tubes pic c/o www.tubesandmore.com
Page 16; Electrocuted dude pic from http://www.chacha.com/gallery/4357/ideas-for-punishing-bad-drivers, copy write: Shutterstock