Tom Lees'

AMP LAB

1974 Ampeg SVT Bass Head

Many significant, even world-changing, creations have come by way of serendipity. Take ink jet printers, vulcanized rubber, the Slinky, Silly Putty, even – schwing! – Viagra. Other creations that have shaped our world have come from vision and hard work. The 1969 NAMM Show in Chicago saw the unveiling of a behemoth born of the later. With one eye on stadiums across America, and another eye staring down the venerable Marshall Major amp, designers Bill Hughes and Roger Cox of Ampeg unveiled the Super Vacuum Tube amp. Forty years later, this amp is still considered by many to be the benchmark by which other amps are judged. So, is the SVT all that?

While we were waiting for the arrival of our new Audio Precision test system, we raided the personal amp stash of our Editor-in-Chief, and found this battle-scarred beauty of an SVT specimen. Ampeg amps can be a bit tricky to date. However, we can preliminarily conclude that the black control panel graphics with square corners and black switches generally place the amp in the 1972 – 1975 time frame. Moreover, tearing the amp apart, we were able to read several EIA codes and other designations on parts within the amp. The identified dates ranged from late '73 to '74, with the latest code found on the filament transformer having a 1974 date. So, we will call this a '74.

Fig. A - Gut Shot

Fig. B - Biasing the '74 SVT was made pretty simple

Construction

This is one amp I would not want dropped on my foot. Weighing in at over 85 pounds, the SVT is truly built like a tank. That size and weight is not wasted, however. The head cab supports preamp circuitry in a first chassis that is located towards the top of the cabinet. Of note here is the angled plate that the preamp tubes extend through. This feature not only efficiently utilizes space within the head cab, but it also makes swapping tubes much easier – especially when the head cab is perched on a corresponding speaker cab. A separate chassis is bolted to the bottom of the head cab that supports the transformers and output circuitry, and a single Molex connector couples the preamp to the power amp. In *Fig. A* below, the power tubes were removed to illustrate the separate preamp chassis and power amp chassis. In this view, the rear grill was removed, which is all that is necessary to gain access to the preamp tubes and power amp tubes.

One aspect that I really love about this amp are the features directed towards basic serviceability and routine maintenance. Pull the Ampeg grill cloth off the front cover to expose the chassis, as seen in *Fig. B*. When facing the front of the amp, the controls necessary to bias the amp are on the face of the chassis to your left, with clear instructions on biasing to your right. Also from the front, you can easily change several of the phase inverter and power amp driver tubes.

Internally, the SVT is a combination of circuit board construction and hand wiring, as illustrated by gut shot of the power amp shown in *Fig. C*. As this shot illustrates, despite the use of PCB boards, there is still quite a bit of manual labor and hand wiring required to assemble this amp.

Understanding the Amp

The amp is divided generally into two channels. The first channel utilizes three 12DW7 tubes, each tube associated with a corresponding series stage. The first stage implements selectable ultra-hi filtering controlled by the ultra hi switch, selectable ultra-low filtering controlled by the ultra low switch, and volume control. The second stage implements the treble and bass filtering, and is implemented by a classic Baxandall tone stack. The third stage implements the midrange control.

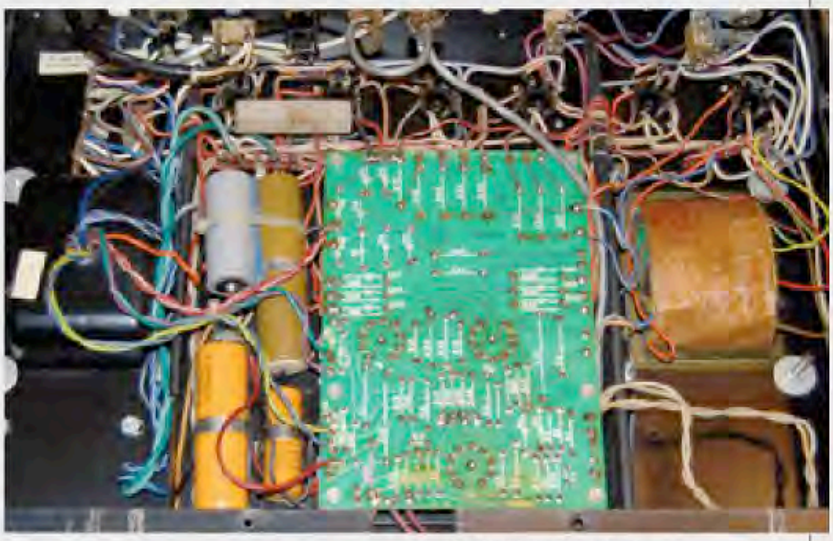

Fig. C - Power Amp chassis

The second channel utilizes a single 12AX7 and two serial stages. As with the first channel, the first stage implements the ultra hi and ultra low functions that are simplified over the versions implemented in the first channel. Also like the first channel, the second stage implements the treble and bass filtering and utilizes the same Baxandall circuitry utilized in the first channel.

A single 6C4 tube is used to mix the output of the first and second channels, and the output of the mixer is coupled to the power amp circuitry, which includes a 12DW7 phase inverter tube, a pair of buffer/driver 12BH7 tubes and a sextet of 6550s. Particularly, the phase inverter (PI) splits the signal from the mixer into two signals that are out of phase

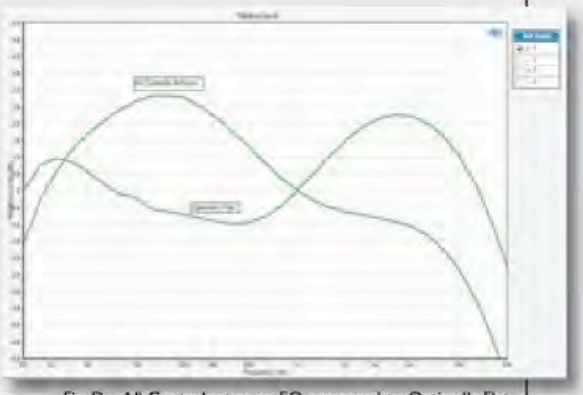

Fig. D – All Controls at noon EQ compared to Optimally Flat
-10dBu input signal swept 20Hz-20kHz
Deviation +/- 2.23dBu

Fig. E – Optimally Flat EQ settings
Ultra hi set to 0, midrange set to 220Hz and
Ultra lo set to 0 (middle position)

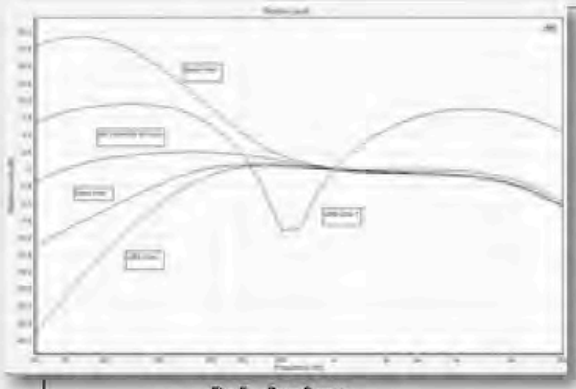

Fig. F – Bass Sweep
-10dBu input signal swept 20Hz-20kHz

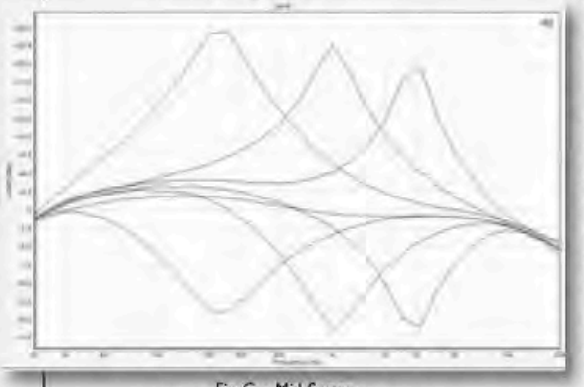

Fig. G – Mid Sweep
-10dBu input signal swept 20Hz-20kHz

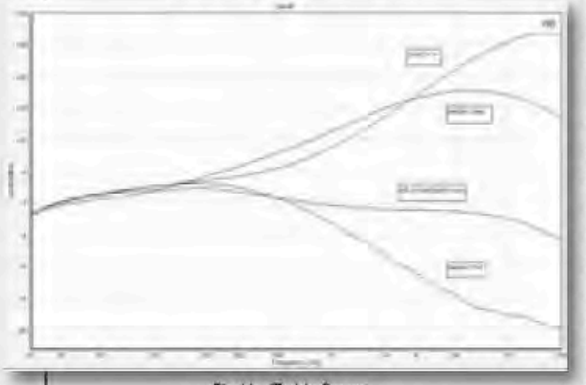

Fig. H – Treble Sweep
-10dBu input signal swept 20Hz-20kHz

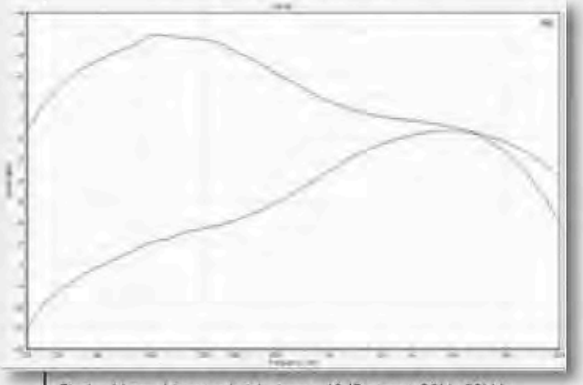

Fig. I – Normal input v. bright input -10dBu input, 20Hz-20kHz

with each other. A first buffer/driver takes the first PI output and drives three of the 6550s. Correspondingly, the second buffer/driver takes the second PI output and drives the remaining three 6550s.

The Tone Stack

Between nright and normal jacks, three-band EQ, ultra hi and ultra low switches, and switchable mid frequencies, the SVT offers up a wealth of tone shaping options in its preamp section. Before jumping into the tonal flexibility of this amp, some general characterizations may be made. *Fig. D* illustrates channel 1, normal input jack, all controls at noon compared to "optimally flat." The "all controls at noon" curve has a deviation of just over +/- 4dB, with a pronounced hump between 100Hz and 200Hz and a treble roll off in the upper frequencies.

The optimally flat curve I came up with looks far from optimally flat. In the "all controls at noon" curve, the ultra hi was set to 0, ultra lo was set to 0 and the mid control was set to 200 Hz. As this is where the hump was, I began pulling back on the mids. In doing so, the band interaction caused by pulling out the mids resulted in the optimally flat curve. As can be seen in *Fig. E*, the treble was goosed just a hair from its default noon position, and the bass control was cut back just shy of its default noon position. Someone may be able to coax a flatter response out of this amp, but I tried several times running through several variations of controls, and the illustrated approach was the one that I could repeat.

The frequency sweeps are a convenient way to fully appreciate the interaction of the various EQ controls. In *Fig. F*, the bass sweeps include sweeps of the ultra low switch positions with the bass control at noon. Notably, the ultra low "+" is not a bass boost at all. Rather, in this switch position, a notch filter is provided at about 500-600Hz. The notch filter appears in the circuit before the tone stack and removes mids, creating the perception of more bass. The ultra lo "–" switch setting on the other hand, does filter the low end. In this regard, the filtering of the ultra lo set to the "–" setting with the bass control to noon is steeper than setting the ultra lo switch to 0 and setting the bass control to min.

Of note in the EQ sweeps is the degree of tone shaping available. The EQ controls are capable of huge amounts of EQ adjustment, in some cases providing just under 40dB of adjustable range. Also notable, when the ultra hi switch is set to its "+" setting, the slope of the treble boost changes, and a huge treble boost is provided. A little EQ on this amp goes a long way on this amp.

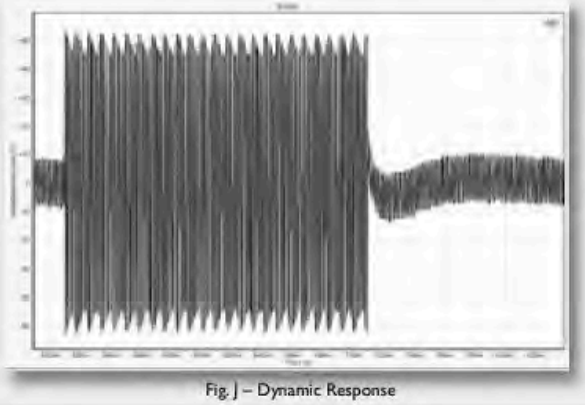

Fig. J – Dynamic Response

Output Power

The '74 SVT had no problem outputting 300 watts of power with a -10dBu signal. Moreover, the amp did not seem to care whether the first or second channels were used, as the measured output power was substantially similar between the two channels. Dynamic power testing of the amp yielded some interesting results. The amp did not extend significantly beyond its rails when pushed by a transient signal. That said, the amp chose to go into a gradual soft clipping that is so characteristic of tube amps by gently rounding the corners of the signal near the rail. There was also a noted exaggerated ring lasting approximately 60ms before converging. This "sluggishness" is also not uncommon to tube amps. Another interesting characteristic of this amp is the less than linear gain characteristics, as seen in *Fig. I*. What this chart tells us, is that for a given fixed set of tone and volume control settings, the amp delivers a different amount of gain for input signals of various strength.

Conclusion

I remember my parents constantly telling me to listen to my grandparents, because there was still a lot I could learn from them. Well, there is a lot we can learn from this old amp. From the convenient biasing controls on the front of the amp, to manufacturer-recommended biasing instructions clearly labeled and legible 35 years later, to the angled preamp tube positioning, flexible EQ, and simple user interface, this amp was built to be as easily field-serviced as it was played. Should all amps incorporate these features? No, of course not. The takeaway here is not specific features as much as it is a recognition that the designers appeared to have a ground-up understanding of what niche this amp was intended to fill, and they took every advantage possible to cram useful features into the design.

Editor's note: See more about Ampeg products on our youtube channel at YouTube.com/BassGearMag.

SVT by Ampeg. The world's most powerful musical instrument amplifier has been "re-created" by Ampeg to once again assume its rightful place at the forefront of contemporary stage amplification. With an awesome power output of 300 watts RMS continuous at less than 5% THD (total harmonic distortion) from a specially designed tube amplifier working in tandem with a massive "isolated cobalte bottle" speaker cabinet rated at 350 watts RMS, the Ampeg SVT can produce more than enough sound for any live concert application — from clubs and theaters all the way up to arenas and stadiums.

Applications

It's been said that "big noises come from big boxes." A breed apart in a world filled with shrinking, transistorized "mini" amps, the SVT "Grand Touring" amplification system offers final proof that a really **does** take big amplifiers (packing large quantities of air in motion) to obtain the kind of "big sound" preferred by many of today's musicians. And, pronunciation claims aside, there is really no substitute for tubes and the distinctive sound they project. The most powerful tube-type production amplifier in the industry, the Ampeg SVT also provides a full complement of highly accurate bass, treble and midrange **equalization** controls for unmatched tonal flexibility and control in an amplifier of this size and type. All of this controlled power is supplemented by a variety of user-oriented features like a standby pilot light, removable grille panels for easy access to amplifier and speakers, Pagged, flush-mounted Sessions" hardware, fan cooling and a speaker impedance selector switch (2 or 4 ohms) with dual output jacks to facilitate the use of additional speaker cabinets. The Ampeg SVT – a road amplifier in the best sense of the word.

Circuitry Design

The latest thinking in tube circuitry design has produced a potent tube-type amplifier capable of generating 300 watts RMS continuous (700 watts peak music power) into a 2 or 4 ohm speaker load. This in turn can produce in excess of 140 dB Sound Pressure Levels at 10 feet on axis – an almost unheard of amount of power and projection even in this day and age. The SVT amplifier features a separate drop and pre-amp for maximum efficiency — just like the separate components in sophisticated hi-fi systems. A hefty tube complement comprised of two (2A3CB, 6550Bs two (2)6H7As, three (3)7WTs, one 6C4WA, six 6550s and three extra heavy-duty transformers are the source point for the SVTs tremendous power and clarity. The amplifier is housed in a 1/8" thick steel chassis for superior to aluminum for strength and protection against noise interference from external sources. The SVT features tube bias control adjustments in an accessible location so that newly serviced tubes or older tubes can be easily adjusted for maximum performance. A power-bias and ventilating rear panel grille ensure that the amp always runs at minimum temperature levels. Other important features include a special Hum Balance control to optimize tube balancing and residual hum, two rear panel mounted speaker jacks with an integrated "motor-rated" toggle-type selector switch (2 or 4 ohm selection) for additional economy, a standby switch which extends tube life as well as keeping tubes warm for instant-on use and four steel cord wrappers.

With all of this, one of the SVTs most notable features is its unique toroidal coil inductor which provides a substantial boost over a narrow bandwidth to offer the user greatly expanded midrange control capabilities so that the SVT can be used effectively as a bass guitar or keyboard amplifier.

Control Section

If pure power is the heart of the SVT, then its expanded bass, treble and midrange equalization control system represents the **mind** of the SVT. It offers the player two separate channels, each with treble, bass and independently adjustable volume controls plus four separate inputs for mixing signals and volume levels from many sources ("instruments"). Channels 1 and 2 feature an input sensitivity of 30 mV for full power, enough to provide amplification for even the weakest musical instrument pickups available. The previously mentioned toroidal coil, the most effective inductive coil design available, makes possible a greatly expanded three-frequency (220 Hz, 800 Hz, 3000 Hz) midrange **equalizer** section offering ±20 dB of boost and or attenuation at the frequencies most critical to the fundamen-

Cool page out of a 1982 Ampeg SVT brochure

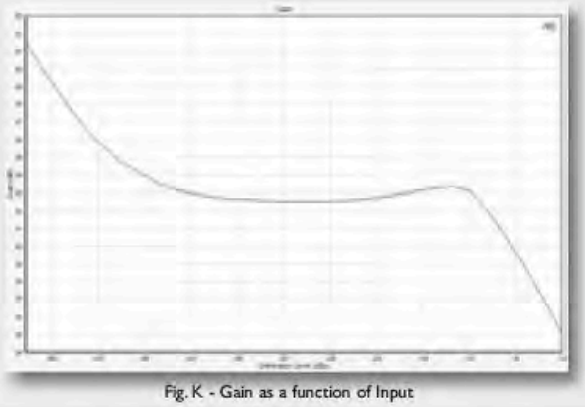

Fig. K - Gain as a function of Input