Chapter 1

How All This Came About

by
Hartley Peavey

As most of you know, electronics have been around a very long time. In the latter part of the 1800s, Thomas Edison perfected the incandescent lightbulb. Edison experimented with thousands of combinations of materials before he finally found that a small Tungsten filament inside an "evacuated" glass container would convert electricity into light. These early bulbs suffered a number of problems, but generally were perfected enough for general use by the early 1890s... After extended use, it was discovered that the inside of the clear glass "bulbs" would gradually darken, thus absorbing much of the light generated by the incandescent filament. Various schemes were tried to reduce this, including introduction of various "Noble" gases, as well as insertion of other metal conductors in attempts to "drain off" whatever was causing the inside of Edison's bulbs to blacken after extended periods of use.

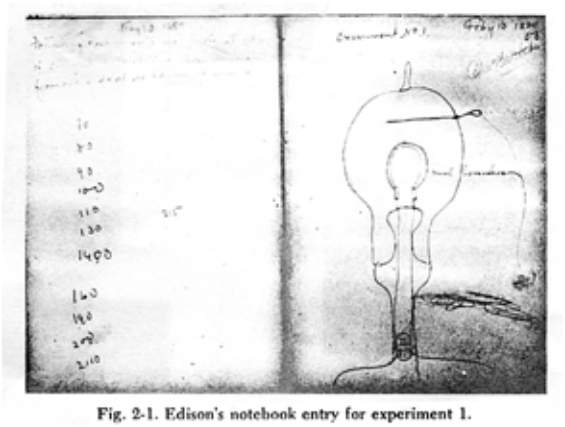


Fig. 2-1. Edison's notebook entry for experiment 1.

Edison's Bulb

In the 1890s, Edison's lab encountered a then-unknown phenomenon…. They discovered that if additional conductors were placed in the bulb and charged with positive voltage, a current would flow through the vacuum from the filament to the additional electrode. He discovered that if you had a filament that was heated to incandescence and included another electrode in the tube, it would indeed cut down on the blackening, but most importantly, when the additional electrode was made positive in relation to the filament, a current would flow. Edison called this phenomenon the "Edison effect." In essence, Edison had created the first vacuum tube "diode," a.k.a. rectifier.

Before going further, I should explain that a diode is an electronic device that passes current only in one direction (i.e. a "check valve" that allows electrons to flow in only one direction). It had been long known that electrons possess a "negative" (-) charge and therefore are attracted to anything having a positive (+) charge. So the flow of electrons is (and will always be) from negative to positive.

The aforementioned "Edison effect" became widely known, and various labs on both sides of the Atlantic performed extensive research. The modern vacuum tube utilizes three or more "electrodes" whose effect was discovered in 1903 by an American named Lee DeForrest. He discovered that if an electrode with a negative charge was inserted between the incandescent filament and a positively charged electrode (anode), that the flow of current could be controlled (modulated), thus causing the device to act like an "electronic valve"… This is why most of the world refers to vacuum tubes as "valves" since essentially that is their function. In North America, we generally call these devices "tubes" because that is the usual "physical configuration" of the electronic valve. Whether you call it a tube or a valve is immaterial; the fact is, these devices have been with us now well over 100 years! It goes without saying that after 100 years of research and development, tube-type audio amplifiers are a "mature" technology here in the 21st century.

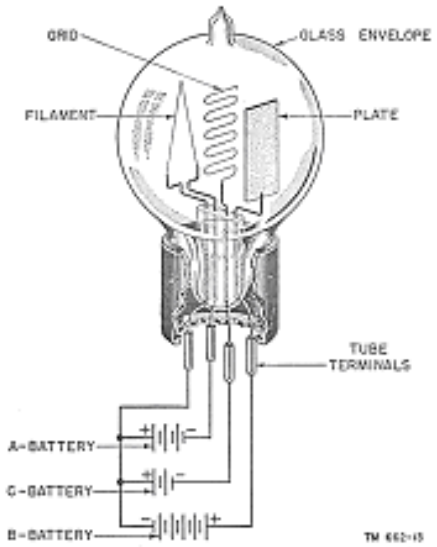


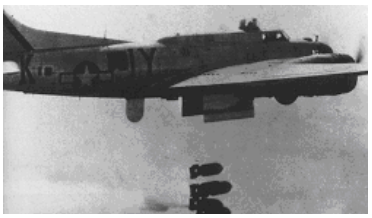
Figure 4. Construction of DeForest's three-element tube, or triode.

From Lee DeForrest's first triode (called the "Audion") came many developments both in audio and radio frequencies. There were several early pioneers in Europe who were developing multi-element "valves" at or about the same time as DeForrest, namely, Fleming and Marconi in the U.K. Most

folks credit DeForrest with the first practical triode. Regardless of who actually invented it, vacuum tube/valve-type electronics dominated the scene until the commercial advent of transistors in the mid 1950s. A collateral development regarding audio was the introduction (in the '20s) of the "dynamic loudspeaker" by Magnavox. These speakers were very similar to speakers today in that they featured a paper cone, a voice coil, and a fixed magnet. Because truly effective "permanent" magnetic materials had not yet been developed, most loudspeakers prior to the late '40s had electromagnets instead of so-called "permanent" magnets.

RADIO & THE POST-WAR WORLD

The first major use of audio amplifiers was in radio, and by the late '20s and early '30s, so-called "talking pictures" had been invented and spread across the world in just a few years. Most of the early audio amplifiers of any size were directed at the need for sound systems for movie theaters. Because audio amplifiers were essential for effective long distance telephone communications, both Western Electric and AT&T were heavily involved in audio amplifier research. Western Electric made equipment for the Telephone Company, as well as for theaters and other uses. Obviously, AT&T had a huge investment in infrastructure with "repeater stations" across the country and even undersea cables connecting the continents by the mid '30s. One of our nation's leading early research institutes was Bell Laboratories (named after Alexander Graham Bell, the inventor of the telephone). This organization provided a host of patents for audio, some in full force up to the late '50s. RCA is another company that was deeply involved in audio amplification primarily for home entertainment, radio, TV, and of course, theaters.



R-17

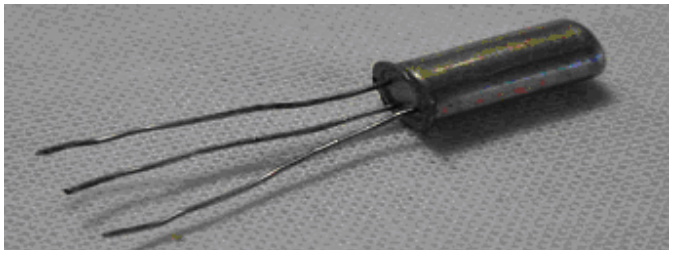
6L6GCs

World War II diverted much attention from the audio field to military matters, and many important electronic breakthroughs such as radar, sonar, and electronic computers came out of this effort. It would be worthy to note that RCA Labs in 1936 and 1937 developed the venerable and ubiquitous 6L6 tube and its "little brother" the 6V6 a year later. I believe it is noteworthy (and incredible) that the 6L6 power tube is still around and in production in 2005! I can think of no other electronic device that has enjoyed such a lengthy useful life span. Although the 6L6 has gone through multiple iterations, the 6L6GC is still probably the most popular AUDIO power tube in the world today.

Old Phono

Old Black and White TV

After WWII, there was a huge demand for civilian electronic equipment. Television, introduced in a few cites before WWII, "exploded" across North America and in other nations. There was a huge demand for not only television sets, but also other forms of home entertainment, i.e. radio and record players. Toward the end of the '40s, the 33_-rpm record was introduced first as a 10" record (apparently, to provide the same diameter "platter" as the 78-rpm records, which was the "standard"). These later expanded to the "new standard" 33_-rpm 12" vinyl "long-playing record" (LP). The race was on to provide "better" sound. The term "hi fidelity" became popular in the late '40s and early '50s. A number of companies rushed into that field, creating home entertainment equipment of ever-increasing sophistication and performance capabilities. Of course, vacuum tubes provided the amplification. It was not uncommon to see TV sets with 20 or 30 vacuum tubes, especially in early color television sets.



Old Transistor

As you probably know, Bell Labs invented transistors in 1947-48, but really were not commercially feasible for most audio purposes until the mid '50s, with the first transistor guitar amps showing up in the early '60s. The first "major" company to effectively use transistors in guitar amps was Standel. I am

sure there were others, but Standel seems to have been one of the first in the market utilizing germanium preamp and output devices. Germanium is a good semiconductor, but proved overly susceptible to heat-related problems and was soon replaced by infinitely more reliable silicon transistors.

Old Radio

As stated above, radio became a very widespread phenomenon in the 1930s. There was a huge demand for program content that almost invariably required (or involved) music. Early soundtracks for movies and radio programs were provided by conventional instruments that were miked and either recorded or broadcast "live" over the networks: NBC, ABC, Mutual, CBS, etc. At the same time, moviegoers demanded better sound to match color motion pictures, which began to appear in the late '30s. After WWII, there was a huge demand for entertainment of all kinds and there was a major race for who could come up with the latest gimmick. In the late '40s, RCA introduced the 45-rpm record ("the little record with the big hole") and in 1957 and 1958, STEREO was introduced and there was another "boom" in consumer electronics. As people traded in their old AM radios for FM radios, they also wanted the ability to play stereo LPs. The new stereo systems required DOUBLE the number of speakers and DOUBLE the power amps. This fueled a huge trend for hi-fi "component" suppliers like H.H. Scott, Fisher, Marantz, etc., as well as the traditional suppliers of home entertainment such as Philco, Magnovox, RCA, Sylvania, etc.

After WWII, much of Europe was in a period of reconstruction. England, however, was considerably ahead of the U.S.A. in the hi-fi field. Many of the early hi-fi and later stereo innovations in hi-fi electronics and loudspeakers came from England. Before the early '50s, there really wasn't much available in the U.K. regarding modern power tubes (valves). American 6L6 tubes had become dominant in the then-higher powered amplifiers for home entertainment. There was considerable demand in the U.K. and also in other European nations for power valves that could provide 10 to 15 watts output, as well as a higher level of 30 to 50 watts. A European company (a division of Phillips, I believe) first developed a tube roughly equivalent to the American 6L6, which itself had gone through several changes, and was by then called the 6L6GB. The EL-34 was technically a better tube (valve) than the 6L6 (electrically speaking)… Mechanically, however, the structure of the EL-34 was never designed for "high vibration environments" and therefore not as good as a 6L6 from a "mechanical" (microphonic) standpoint. Simply put, the "new" EL-34 was electrically better (but mechanically inferior) to the venerable 6L6. Just as the 6V6 followed the development of the 6L6, the EL-84 rapidly followed the introduction of the EL-34. Today, many valve/tube amplifiers on both sides of the Atlantic utilize the EL-34 and EL-84, which many (including myself) think sound better than their U.S. counterparts.

EL-84 **EL-34**

GUITARS & POP MUSIC

Meanwhile, in the U.S.A., the demands for entertainment inspired more people to become entertainers by playing guitar. Just prior to WWII, musicians such as Charlie Christian introduced "electrified" guitar to big bands. After the war, there was a huge demand for electrified guitars. Companies such as Rickenbacker, Gibson, Gretsch, and others offered guitars with integral magnetic pickups. Most of these companies also provided amplifiers for their instruments. This trend was further enhanced by the popularity of so-called "Hawaiian" or lap steel guitars. In the late '40s, most guitars were built using more or less conventional "violin making" techniques… Why? Because most of the early guitars were built by violinmakers!

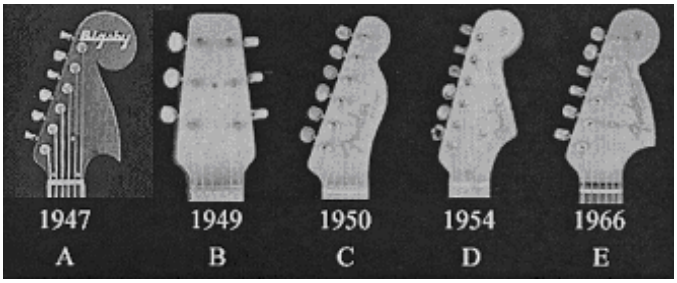
The popularity of the solid-body "lap steel guitar" inspired several builders to try the same type construction on six-string "Spanish" guitars. This was especially attractive since traditional hollow body type

guitars tended to be “microphonic” and “squeal” when the soundboard of the guitar reacted to the sound from the amp, thus creating “acoustic feedback.” This was a real limitation as amplifiers and venues got bigger. Since the “solid-body”/Hawaiian steel guitar had firmly established itself, it seemed a natural step in the “evolution” of the guitar to create a “solid-body” Spanish guitar. This was, in fact, done by several builders. A West Coast craftsman by the name of Paul Bigsby built several solid-body electric guitars in his backyard workshop. One of the first of these was sold to the famous country guitarist Merle Travis in the 1947/48 timeframe.
Elsewhere in California, two friends decided to build

Lap Steel Guitars

1947 Merle Travis

1950 Telecaster



“Evolution” of Fender’s Peghead Design

Hawaiian (lap steel) guitars and amplifiers to go with them. Leo Fender and “Doc” Kaufman formed a company (K&F) for that purpose. Shortly thereafter, Kaufman left the partnership and Leo continued to build solid-body “lap steels” and amplifiers. Apparently, Leo saw some of Bigsby’s work, and in the late ‘40s, he produced a solid-body electric guitar that he called the “Broadcaster.” This was essentially a very “plain-Jane” instrument using the same construction techniques as the lap steel, but featured a replaceable bolt on neck. Leo’s first guitar had a conventional three-per-side peghead that soon gave way to the six-in-line configuration pioneered by Bigsby. Leo named his guitar Broadcaster, which created somewhat of a problem since apparently Gretsch (another guitar manufacturer) produced a set of drums also named Broadcaster. Leo then changed the name to Telecaster and the rest is guitar history!

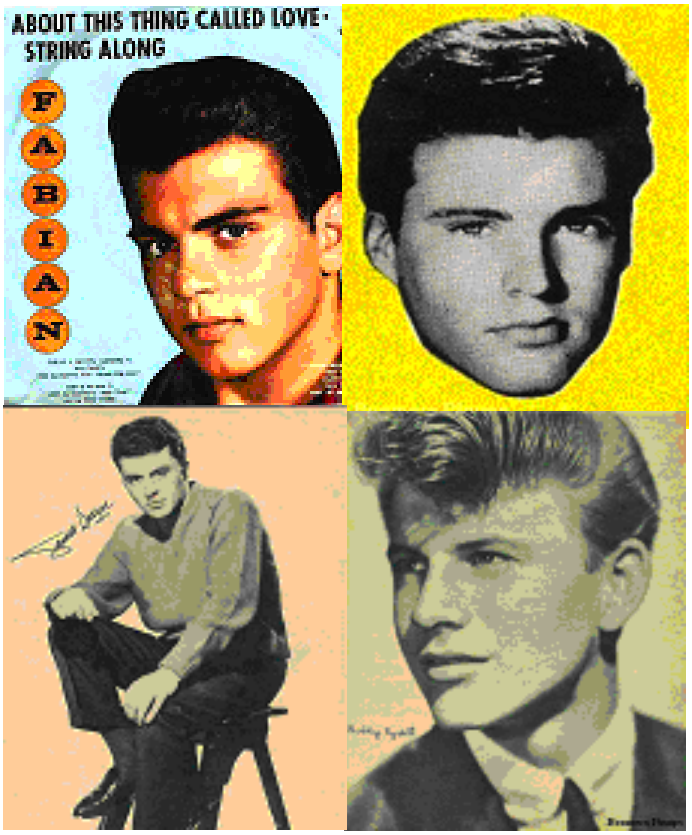
Back to the saga of tube amplification… The end of the war also brought about some rather profound changes in music itself. Because the war effort had caused a number of important economic changes in many areas of the U.S.A., music was no longer limited to that coming from the major population centers such as New York and L.A. In “grassroots America, so-called Hillbilly/Country and Western music was huge and in many areas across the U.S., people now had the money to buy home entertainment equipment and were eagerly looking for places they could go and listen to live music. Western movies also popularized so-called C&W music, made popular by numerous “singing cowboys” such as Gene Autry and Roy Rogers. Record sales increased in the heartland of the U.S.A., and many musical groups began touring. Western swing originated in Texas and spread like wildfire over the Western part of the U.S. Nashville’s Grand Ole Opry was in its prime. Electric guitar and multi-track recording techniques were made very popular by Les Paul, who also pioneered effects such as echo, overdubbing, and multi-track recording.

So-called big band music was “winding down” not only because of the high cost of keeping a large orchestra on the road, but also because people’s musical tastes had begun to shift. By the early ‘50s, almost every orchestra featured an electric guitar. Les Paul emerged with a new and exciting guitar sound. Country pickers proliferated and the race was on for bigger and better amplification. A number of companies made amplifiers, but most tried to make guitar amps in the same manner as consumer radio equipment had been made. Most amp manufacturers used “scramble wiring” with electronic components stretched from terminal strips to tube sockets_sometimes called “point to point” wiring.

WWII had produced many valuable lessons about how to construct rugged tube-type equipment. Almost invariably, this construction utilized "terminal boards" for the components, with wires going to the tube sockets and/or any external switches, controls, pots, etc. Leo Fender was one of the first guitar amp manufacturers to adopt this rugged style of construction. Strangely, many of his competitors didn't figure this out until the late '50s or early '60s, and some never did! Leo's amps were fairly simple adaptations of standard "textbook circuits." The Fender Company applied for many patents on guitars, but interestingly in the entire 19-year history that Leo was at Fender (1946-1965), they only received two circuit patents, which were for tremolo circuits. One of those "innovations" apparently was borrowed from an article by Richard H. Dorf in the April 1954 edition of "Radio Television News," a technical journal aimed at electronic hobbyists and repairmen.

Clockwise from top right: Carl Perkins, Bo Diddley, Chuck Berry, and Elvis Presley

By the mid '50s, C&W music merged with rhythm and blues and the "rockabilly revolution" began. Much of this was done in the Mid South with Memphis's Sun Records being a focal point. Elvis, Carl Perkins, and a host of others became involved and soon, so-called "rockabilly" morphed into what we now call rock 'n' roll. Black performers heavily influenced this music, and by the mid-to-late '50s people like Chuck Berry, Bo Diddley and a host of others came on the scene. Rock 'n' roll had begun with a bang! This was especially important at that time, because the baby boomers had reached their teens. The music business "exploded" and so did the demand for electric guitars, basses, and the amps they required. This continued through the late '50s and into the early '60s.



'60s Teen Idols

Rock 'n' roll co-existed with R&B and "soul," which had now become mainstream. Much of the pop music that was so much in demand for the previous five years or so had "devolved" into what some called "little girl music" with "syrupy lyrics." Teen-oriented movies and music were more designed to appeal more to little girls than to guys. For example, Leslie Gore's "It's my party, and I'll cry if I want to" became typical. "Pretty-boy" stars such as Bobby Rydell, Fabian, and others were hyped far beyond their ability to perform. In addition, American music in the early '60s went into a kind of "holding pattern." During the late '50s, much of our rock 'n' roll music was exported to the U.K., where it had a profound influence on young British musicians who listened to the seminal American rock 'n' roll. They "repackaged" it and sold it back to the U.S. in the form of the Beatles, the Rolling Stones, and many others. This is generally referred to as the "British Invasion." Suffice to say, British groups dominated American music for the next few years beginning in the early '60s.
Traditionally, music-instrument manufacturing firms

had (for the most part) been family owned. Back then, Bill Ludwig still owned Ludwig Drums, the Steinway Family still owned Steinway, Gibson was owned by a corporation called Chicago Musical Instruments (CMI) and, generally speaking, all but a few firms producing musical instruments were family owned.

The Beatles

British Groups

When the "British Invasion" started in earnest in 1963/64, conglomerates of all kinds bought heavily into the music and audio business for the next 10 to 12 years. CBS bought Fender, Norlin (a conglomerate with interests as diverse as cement and a brewery in Central America) bought Gibson/CMI, Thomas Organ bought Vox, Gulton Industries bought Electro-Voice (EV), Avnet bought Guild, Gulf and Western (Paramount Pictures) bought Unicord (the Marshall distributor), Beatrice Foods bought JBL, Ling/Timco/Vought (LTV) bought Altec-Lansing and Kustom "went public." By the mid '70s, virtually all of the major firms that were producing music and audio equipment had been "conglomerated." During that time, the usual modus operandi was that the corporate team would arrive, fire most of the former employees, then institute new and different methods and business practices. Almost invariably, their prices went up and the quality went down. Products and people (relationships) became secondary to "almighty" PROFIT!

Peavey was actually conceived in 1964 when I was a senior at Mississippi State University. I had spent seven years trying to be a guitar player with little success. I had managed to get into a few bands and (as usual) each of these groups needed various pieces of equipment, which I would build in my basement workshop on weekends or during school holidays. A trend developed that repeatedly resulted me in being "kicked out" of the group once I built all the gear they needed. After this happened for the THIRD time, I decided that my future as a rock star didn't look very bright. I had to make one of toughest decisions in my lifetime: I had to look in the mirror and be totally honest with myself about where my talents REALLY were. I was good at BUILDING musical things, but not so good at PLAYING music. Because I loved music (and musicians), I decided that I would serve them by building the best equipment at FAIR and REASONABLE prices (unlike the conglomerates). Why? Because almost every musician I'd ever known said that he wished that "somebody would make good gear at a fair price." That sounded like a plan to me!

In 1964, tubes were still "king" in most audio applications. Transistors had started to appear in radios and tape recorders, but by 1964 very few music or audio companies were seriously into "solid-state." It seemed obvious to me that transistors were "the coming thing." I decided that my first products would be transistorized. This was a real problem for me, since I knew very little about transistors. All my previous experience had been with tube amps. I was an avid reader of technology and science magazines back then, and I ran across an ad from a company in Opelika, Alabama, offering to do contract engineering. As it turns out, my contact with this company was most fortunate. The way this company came to Opelika, Alabama, is a story in itself.

During WWII, a German company called Telefunken developed what we call the tape recorder. In Germany, it was called the "Magnetophon." This machine was used for Nazi propaganda purposes and utilized plastic tape with a magnetic oxide coating. As Allied troops spread across Europe in early 1945, Allied forces were rounding up German scientists and inspecting German production facilities to glean any info possible. A Lieutenant J. Herbert Orr was in the U.S. Signal Corp that debriefed many of the German scientists, including a group from the Telefunken company. As our troops swept across Germany, the horrors of war combined with their resentment of having to be in Europe away from their families and careers caused many of our troops to be "less than kind" to many of these German scientists and manufacturing experts. Mr. Orr on the other hand, along with his cohorts, had great respect for the scientists they

The Magnetophon

encountered and what they had been able to accomplish under the most adverse conditions imaginable. Accordingly, Orr's intelligence group dealt with their charges in a professional and courteous manner, and to reward Orr and his associates, a group of the German scientists presented them with drawings, descriptions of processes, and even diagrams and formulas regarding the recording mechanisms and equally important, the formula for the magnetic tape itself.

After the war, these intelligence officers returned to the U.S. and Mr. Orr formed a company in Opelika, Alabama, to manufacture recording tape. For a long time, the foremost U.S. brand of recording tape was Orr's "Irish Brand." Interestingly enough, one of Orr's wartime associates took the info on the "Magnetophon" back to California and started an American tape recorder company called Ampex! For about 25 years, Orr made tape in Opelika, and in the latter '50s, Orr became embroiled in a "format battle" re: the eight-track tape configuration. His opponent was Bill Lear. Lear had an eight-track cartridge packaged in a rectangular plastic enclosure, while Orr's approach utilized a round case with a rectangular protrusion. Both approaches utilized a "back-coated" magnetic tape in a continuous ("mobius") loop. Much was riding on this, but the Lear format won, leaving Mr. Orr essentially out of the booming eight-track business that Lear would dominate. Later, Bill Lear got involved in creating the "Lear Jet" business aircraft.

THE BEGINNINGS OF PEAVEY

As an interesting coincidence, I had a chance to spend some time with Les Paul in New York in late October 2005. I was telling Les the story about how Orr and his Signal Corp people interfaced with the Telefunken scientists re: the tape recorder and the recording tape it used. Mr. Orr got the formula for making the tape and came back to the States while another member of that group, Alexander Poniatoff, came back to the States with the plans for the "Magnetophon" and formed the Ampex company in California. Les was able to fill in a few parts of the story that I didn't know. In the late '40s, Les Paul had been trying to utilize multi-track techniques using a disk recorder. This was difficult or impossible and he was looking for a better way. At this same time, Les had become associated with Bing Crosby, who apparently had put money into a new company called Ampex which grew from the same roots as Orr's recording tape company. Les had tried to interest several companies such as RCA and Westrex (a division of Western Electric) in developing a multi-track recorder… They told Les "it can't be done." Finally, Les was prompted to contact the Ampex company, which agreed to help him with his multi-track product (which they subsequently did). Les added another recording head to the recorder and not only invented multi-track recording, but also numerous other electronic effects such as "overdubbing," tape echo, etc. The interesting thing here is that what happened in the latter stages of WWII in Europe have a direct and common "thread" between Les Paul's career and Peavey. Without that happening, it could well be that Les would have never been the star and innovator that he is, and without Orradio to help me design my first transistor amplifier, Peavey might not exist at all… Interesting "thread" huh?

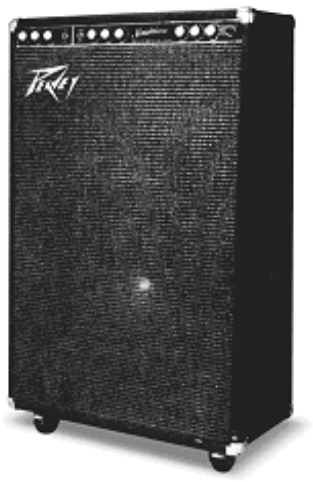
By the late '50s, consumers were moving away from reel-to-reel recorders and looking for a more convenient format, which they found in the eight-track cartridge and, about the same time, the Phillips compact cassette. The waning demand for reel-to-reel tape and the loss of the format war with Lear left Mr. Orr's company (Orradio) with excess capacity, thus they offered their engineering services. That's where I made contact with Ron Matthews, their general manager.

Lear's Eight-Track Tape

Phillips Compact Cassette

I visited with Ron in 1964 and told him I was looking for someone to design a solid-state guitar amp for me. They took on the task, and the first prototype sounded decent and I was very excited about the idea of being able to offer the marketplace a good-sounding transistorized guitar and bass amp. The first prototype was built using (then) state-of-the-art Germanium transistors. I took the first prototype back to Meridian and let a few of my friends listen to it, and most were impressed. Shortly thereafter, I built a case for the chassis and unfortunately I discovered that as the heat built up inside the chassis (now encased

in a cabinet), the transistor bias started to "drift" all over the place. The amp that sounded so good in an open chassis was hardly operable when put inside a case! After another trip to Orradio wherein I demonstrated the problem, it was decided that we would scrap the Germanium design in favor of the latest silicon transistors. We used GE 2N3391A signal transistors and RCA 2N3055 "Homogeneous" silicon power transistors. Ron and his crew accomplished this in about six weeks, and for the first time, I had a good solid-state amp to go to market with. These first models were called the "Musician" (for the guitar amp) and "Dyna-Bass" for bass. These were dual-channel 35-watt amplifiers and represented our total product offering for the first two years at Peavey.



Musician Circa 1965/66

We chose a 35-watt design since that was approximately the power that most companies were then getting out of two 6L6s. We had assumed that our 35-watt solid-state amp would match the competition's 35-watt tube amps…. Not so! Very shortly after we started producing these in 1965, I discovered that we needed nearly twice the power in our solid-state amps to compete with tube amps in the 35- to 40-watt range. My next offering was a 60-watt amp, which I developed in conjunction with a friend from Atlanta named Jim Askew. Jim helped me improve the basic 35-watt design that Orradio had done. This new design gave me more output so that I could effectively compete with popular tube amps and other solid-state amps that had begun to appear in the marketplace. About this time, Marshall introduced 100-watt valve "stacks" from the U.K., which were then the biggest thing around. I decided to go for 100 watts or greater. In '67 or '68 (I don't remember exactly when), RCA came out with a series of specialized audio transistors that were ideal for audio amplifiers. At the same time, RCA Labs in Somerville, New Jersey, developed a set of application notes for what they called "Quasi-Complimentary" solid-state power amps. These application notes were the "inspiration" for many companies seeking to get into high power solid-state audio amplifiers. Almost all the hi-fi companies, as well as Peavey, Crown, and others adopted the basic RCA format. I built a 120-watt amplifier that would more than hold its own against the competition, but I discovered that the "dual slope" protection system as innovated by RCA was virtually unusable with highly inductive loads such as bass speakers. With the "back EMF" voltage from bass speakers, the protection circuit would engage (thinking that the output was shorted), thus causing an unpleasant "snapping sound." I couldn't figure out what was causing this. In utter desperation, I called RCA's applications group in New Jersey and got bounced around to a number of people that seemingly didn't know any more than I did about the problem. After multiple phone calls to RCA, I finally got in contact with a guy named Jack Sondermeyer. When I described the problem, Jack immediately told me what to do about it since he had been on the original design team that developed the now-famous RCA circuit. I had experienced some reliability problems with our output stages and Jack helped me to stabilize my amps with speaker loads that were both inductive and capacitive at the same time. Jack and I conversed often, and I persuaded him to do some "moonlighting" for me. He formed a consulting company called Astro-Associates. He did engineering work for me on an hourly basis and sold me quite a few computer-grade capacitors.

THROW OUT THE MANUAL!

Jack Sondermeyer

Several years later, I drove up to New Jersey to actually meet Jack and his wife, and while there I made a very strong pitch for Jack to come South to become the Chief Engineer at Peavey… Several months went by and Jack agreed to bring his family down and take a "look-see." By that time, Jack's family had grown to where he and his wife Audrey had no less than five children. They all piled in Jack's Ford stationwagon and drove to Mississippi. I took great pleasure in showing them around Meridian and the surrounding area. In 1972, the Sondermeyers decided to make the change and accepted my offer. Jack and his family moved to Mississippi. A pivotal event for Peavey Electronics!

I will never forget that first day in 1972 when Jack came into work. He came in my office and announced that "we are going to throw out all your power amp designs and start all over from scratch!" I told him that he was crazy, that I'd worked for seven years and had finally gotten my solid-state amps where they were reasonably reliable… Much more so than my competition, in fact. I told him that what he was asking was not reasonable because it would be a huge amount of design work, circuit board layout, etc. In addition, I told him that I had very carefully followed the RCA TRANSISTOR MANUAL parameters precisely… He said, "Yes I know, that's the trouble….. all that information is pure bullshit!" I asked him how did he know that. He replied, "I helped write it!" I could only mutter "well I'll be damned." Then and there, Jack and myself proceeded to redesign all our output stages.

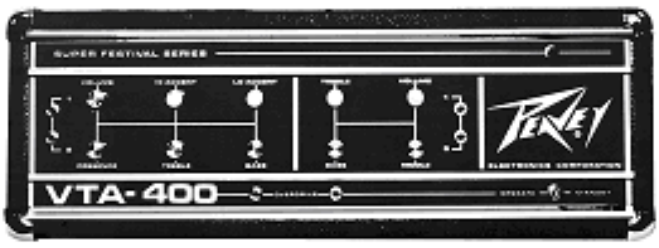
Tube and Transistor Manuals

Jack taught me that tube manuals were pretty much "right on" and that most engineers then were quite comfortable using the specifications in tube manuals to design their products. This modus operandi almost always produced acceptable results with tubes, and since this was the established way of doing things, it had more or less become "standard practice." It was only natural that engineers then used this same practice with new transistor designs. RCA's transistor manual indicated that you could achieve 100-watt power levels with two RCA 2N3055 transistors. A lot of companies tried (Fender, others, and myself) with disastrous consequences. Jack's sage advise saved the day for Peavey and the lessons he taught me (beginning in '72) are still applied at Peavey today… He told me that you can overdrive a tube and the tube could easily recover, but if you overdrive a transistor, you only do it once! If the manual calls for two output devices, use four! If the manual calls for six, use 8 or 10 (i.e. provide 100% ADDITIONAL capacity and the amp will stay together). This was a total departure from generally accepted tube-amp design practice! It took most of Peavey's biggest competitors another 20 years to learn this!

GE Compactron as Used in "Vintage"

Peavey Vintage Amps

Peavey continued to make transistor amplifiers, but several years before Sondermeyer arrived, I had heard musicians all over the country screaming that somebody needed to make an amp similar to the old "tweed" Bassman that Fender discontinued. I heard enough of this to convince me that this was something I needed to look at. Since Fender had abandoned tweed for their Tolex covered equipment, I figured that the tweed look and the demand for it would be something unique for Peavey. In the early '70s, we had several tube amps, one of which was indeed a tweed 410 amplifier that looked almost exactly like the discontinued tweed Bassman. Instead of 12AX7 tubes, I used a new type of tube called a compactron. These unique tubes had THREE triode sections with characteristics identical to one section of a 12AX7/7025. I decided to make our "vintage" amp 100 watts as opposed to the original's 40-watt output. We used two 6C10 tubes and four 6L6GC tubes with a solid-state reverb drive (operated off the negative bias supply). This was a "lot more" amplifier than the original. It had more gain, DOUBLE the power, and built-in reverb. It was an instant success! Because players tended to run these wide open (just like they did the original), the 100 watts and the four efficient Eminence 10" speakers caused severe microphonic problems with the 6C10 preamp tubes.



VTA-400

At about the same time, we also introduced a 200-watt tube amp called the VTA-400. This was a unique product at the time since it produced a very loud

200 watts utilizing four 6550 tubes. This was also the first amp that featured the built- in capability for one preamp to overdrive the other. How this came about is another interesting story.

In the late '60s, I attended a NAMM show at the Chicago Conrad Hilton Hotel. In those days, the various companies rented a room (or a suite) to display their goods. While I was walking the halls of the hotel, I came into a room where a guy was playing one of those cheap Japanese guitars of that time that had a Formica top and four pickups. This was plugged into some cheesy no-name amplifier and I remember being shocked that this lousy guitar and that cheesy amp sounded so good. I stood and listened for awhile and I noticed that there was this guy standing there with long hair and coveralls. He might not have looked too out-of-place in Mississippi, but at the Conrad Hilton, he stood out. He was explaining to the executives of the company how his little box gave the amp more power. He was selling these boxes out of a bag he had strapped around his neck. It was the first time I'd seen Mike Matthews and encountered his little effects box that he called the "LPB-1 Power Booster"… Mike indicated that he was selling these power boosters, and after he stopped talking with the people in the room, I asked him how much he wanted for one of his boxes. He replied "$8.00," and I bought one on the spot.

His box was made out of stainless steel and had a phone plug on one side and a jack on the other. The box was a "clamshell" with the halves attached with small Phillips screws. Since I had driven to Chicago, I had no tools to take it apart, but I remembered that the fingernail clippers in my shaving kit had a small fingernail file attached that would probably suffice to take out the screws. Rushing back to my room, I preceded to disassemble this unit only to find a 9-volt battery and a single transistor with three or four parts attached. I immediately sketched out the schematic and realized this was nothing more than a small "common emitter" preamp… I had been amazed how much difference this box had made in the sound of that cheap guitar and that cheesy amplifier. It really was amazing, and even more surprising was its simplicity. While driving back to Mississippi from Chicago, I realized that my amps (and most others) already had an "extra" preamp. Since Matthews had merely constructed an outboard preamp, I reasoned that it should be fairly simple to incorporate a "patching system" whereby the output of one preamp could be patched into the input of the other channel. We introduced this feature on our VTA-400 in 1970. I took great pride in demoing this because the sound created by cascading the two channels of a 200-watt tube amp was astounding! Apparently others were also impressed by our VTA-400, because the year after we introduced this, a West Coast amp company (Acoustic Control) did the same thing, but improved on my idea by making the cascading of the two onboard channels "footswitchable," which is something I should have thought of, but didn't.

Mike Matthews should be rightfully credited for starting this whole idea of "overdriving" amplifiers. I got the idea from him, but dispensed with the necessity of his external preamp, then Acoustic improved on my idea by making it footswitchable, and thus the era of "overdrive" in guitar amps was born. In every sense of the word, Mike Matthews and his LPB-1 started the overdrive ball rolling. Today, Mike is one of the foremost suppliers of quality vacuum tubes to music and hi-fi tube amp manufacturers.

P.A. OPPORTUNITY

For the first several years of being in business, our only products were the Musician guitar amp and the Dyna-Bass amp. I spent a lot of very frustrating time trying to sell these to music dealers at a time when there were many, many brands of instrument amplifiers in the marketplace. I remember very well a meeting that I had with a dealer in Montgomery, Alabama, where I was trying to interest the dealer in stocking my amplifiers. He told me, "Son, we have plenty of amplifiers, but if you had a good P.A. system, I'd be very interested." On my way back to Meridian, I did a lot of thinking about that. In early 1968, if you wanted a P.A. system, you essentially had two choices: a Shure Vocal Master or a Kustom K-200, both of which were approximately $1,000. The dealer's statement stuck in my mind, and I started thinking about ways that I could build a sound system that would be as good or better than the competition.

My first effort was basically using a guitar-amp chassis and a large faceplate with some additional controls, jacks, etc. This hybridguitar/P.A. amp was kind of a first effort that I realized would probably not suffice long term. I immediately began working on the second-generation unit, which would be a "purpose-built" system as opposed to a guitar amp masquerading as a P.A. amp. During that time, the "in thing" was columns; both the Shure and the

Kustom offerings had so-called column speakers… The Shure units were rather cheesy, being made for Shure by a company in Chicago (Argos). The Kustom unit was basically four 10" speakers in a long, tall box covered with that awful roll-and-pleat covering. I offered my P.A. heads in combination with either four 12" speakers or four 10s…

Building a four speaker column involved significant extra labor in routing out four speaker holes and drilling the mounting holes for the speakers themselves not to mention the additional holes necessary to screw the back to the cabinet and holes drilled through the 3/4" x 1" strips around the front of the cabinet to enable screwing the "baffleboard" to the cabinet. At that time, most speaker cabinets in our industry were made essentially the same. The so-called "firring strips" lined the front of the cabinet and the rear of the cabinet. These strips provided a mounting surface for the baffleboard in front and for the back of the cabinet in the rear. The baffleboard was attached with No. 8 x $1^{1/2}$" screws. It usually took about 30 screws to attach the front and about the same number for the back. For each of those screws, a hole would have to be drilled in the front strips so that the screw could go through to the baffleboard. The back itself had a similar number of holes drilled in order to attach the back to the strips at the rear of the cabinet. Grille cloth was stretched over the baffleboard before it was screwed into the front of the cabinet. Then the back was screwed into the cabinet, thus completing the speaker system. At that time, cabinets were covered with five pieces of vinyl. A top, bottom, two sides, and a back… Five pieces of vinyl had to be cut, handled, and applied to the cabinet. After I had made about 100 cabinets this way, I decided that there must be a better way.

The First PA-3 PA System

In school, I had taken almost every "shop" course I could. By the time I had graduated from high school, I'd had four semesters of machine shop, basic electricity, advanced electricity, wood shop, two semesters of sheet metal shop, mechanical drawing, and two semesters of what we called "radio shop." I know that the way I was building cabinets was very inefficient, but I built them that way since basically that's what everybody else was doing. I went back to all my previous shop training and realized that if I cut a groove into the side panels, top and bottom, in the front and back, I could glue in the speaker baffleboard and the back, thereby eliminating all those holes to be drilled (and indeed the screws themselves). In woodworking, putting a groove into a board is called a "dado," and there are special blades available for a table saw to do this. I built a few cabinets this way and then discovered that I could not build cabinets that way since, there was no place to tuck the material in at the front and back. One of my first employees (Ray Palmer) and I figured out how to cover this column speaker with one piece of cloth instead of five. We had eliminated all the holes and all the screws and eliminated the extra time and work of having to cut out and handle five pieces of vinyl. Only one major obstacle remained and that was how to attach the grille cloth to the front of the cabinet… Because the cabinet was now glued together as opposed to being screwed together, it was necessary to stretch the grille cloth over a frame. This was a fairly simple process, but because of the long slender frame necessary for a column speaker, the sides of the frame would bow inward in the center. I tried to figure out some way of bracing the center, but discovered that trying to avoid having the brace over a portion of the speakers would only add height to the cabinet. I reasoned that I could reinforce the frame if I had some kind of "angle iron" to stiffen up the sides.

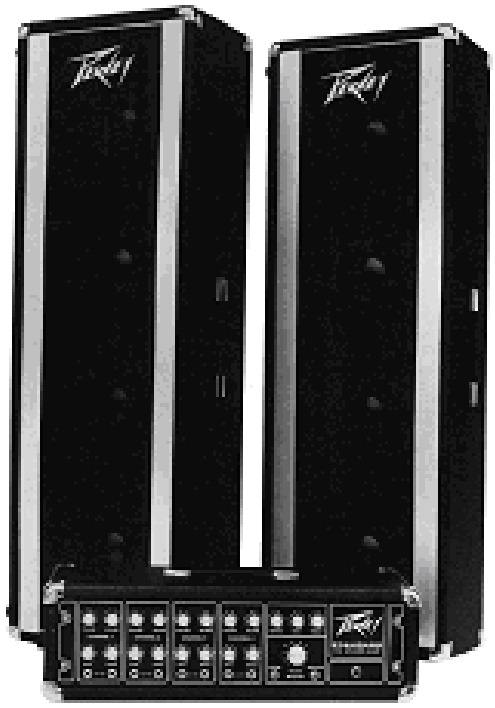
In the late '60s, there was an aluminum extruder in town whose primary business was fabrication of aluminum windows. I went out to their factory to

see what kind of standard angles that they had and found that they basically had only two. One was 1/2" x 1/2" and the other was approximately 1/2" x 2". Of course, I tried the smaller angle first, only to discover it was useless, then I tried the larger angle and found that it was sufficiently strong to prevent the sides of the grille frame from "bowing." At first, I put these aluminum angles BEHIND the grille frame and used a silver grille cloth that contrasted nicely with the black Tolex vinyl covering. One day I just happened to stick a completed grill frame into the cabinet backward, and I noted that the two aluminum strips complimented the cabinet very nicely. So I made up another frame with black grille cloth with the reinforcing aluminum angles on the outside instead of the inside… The era of the "aluminum strips" as a Peavey trademark had begun, and this distinguishing feature was a part of virtually every Peavey amp and speaker for the next 40 years.

By eliminating a tremendous amount of useless labor in building speaker cabinets, we were able to build a better cabinet that would never vibrate loose for approximately 40% less cost than our competitors. In mid-1968, we started offering a four channel 100-watt P.A. system with two 4-12" columns for $599 list. We couldn't make them fast enough. The sound system portion of our business has remained the largest part of our business since.

By the early '70s, so-called column speakers "went out of style" and people were demanding larger, more efficient two-way systems. At that point and time, stamped-frame speakers were available from CTS, Eminence, Oxford, and several other small speaker companies. So-called premium speakers were available from JBL (then distributed by Fender), Altec, and Electro-Voice (distributed by Kustom). I tried to design some better speaker cabinets, but ran into significant difficulties either with the price or the performance of (then) available "premium" cone-type speakers and drivers. We had established an OEM relationship with JBL, but we discovered severe reliability problems because of their paper voice coil formers. Ditto Altec Lansing when we switched over to them from JBL. We experienced thousands of field failures with Altec's 808 drivers…

It's been said that "necessity is the mother of invention"… So it was back in the late '50s, when I built my first big amplifier… So it was when I had the necessity to build my own high performance speakers so that Peavey could expand into the high level sound reinforcement… See Chapter two for details on this…..



Standard PA System

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