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ElectronicTonalities

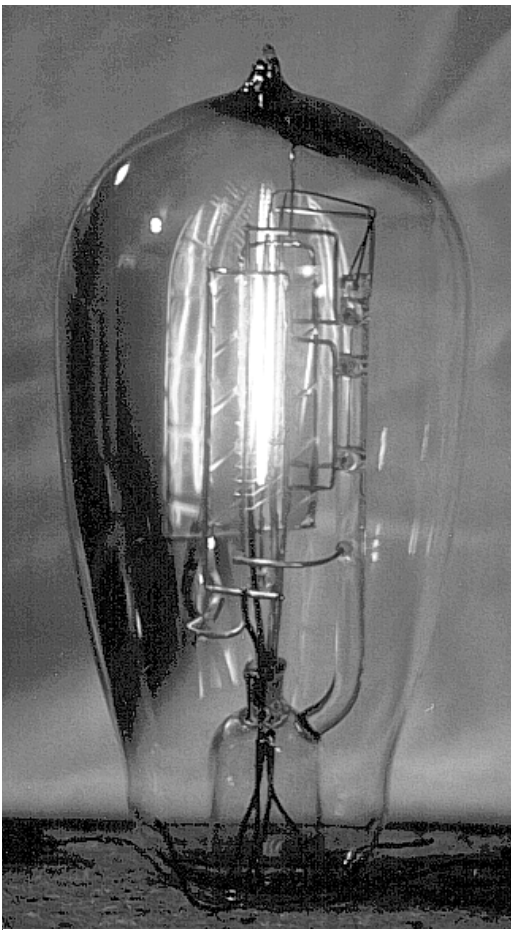
VALVE

Blues Master
part 2

Bascom H. King on strapping SE amps for more power

Ron Welborne's parafeed 6EM7 amp

cool technical stuff from Brainiac



Triode Number 1,
a $1600 hand built output tube from Japan

volume 5 number 2 1998

VALVE

the monthly magazine
of eXtreme audio

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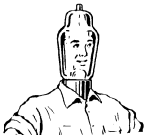

editor's thing

This month's guest editorial is by John Wyckoff.

O.K. Dr. Bottlehead, and all you pediatric Bottleheads, everything you know is wrong. Not only are you wrong, so is everyone who writes for or reads *Vacuum Tube Valley, Sound Practices, Glass Audio,* or any other publication which worships at the satanic Altar of the Vacuum Tube.

How do I know this? I've been told by no less an authority (and no more) than David Aczel, publisher and chief ranter of *The Audio Critic*. You see Mr. Aczel learned on the Internet that "Tubes are for Boobs." Yet on the very next page of issue #24, Mr. Aczel's journal for the audio paranoid states, "A man's ambitions must be mighty small to write his name on a toilet wall. A tweak's ambition is smaller yet to post a dumb message on the Internet." Right, let's get this straight, "Tubes are for Boobs" is something profound on the Internet, anything to the contrary is bad graffitti, got it?

It is obvious to me that Mr. Aczel suffers from a HUGE Napoloenic complex, (is that an oxymoron?) free will does not figure into Mr. Aczel's world. Either you believe he is the ultimate authority, or you're a boob. Is that clear? Actually I think the whole debate about Which is better, Tubes or Transistors?, is silly. If you like the sound of solid state devices, listen to them; if you like single-ended tube sound then listen to those. It's your money, spend it how you want. After all, you're nearly a grown-up.

Home Hi-Fi is supposed to be for entertainment, entertainment is supposed to be for fun. Mr. Aczel seems to be bent on kicking the f out of fun, rendering it completely un

If you think that the wee minions of Stan's Tubedom are receiving the main thrusts from Mr. Aczel's righteous sword, you are wrong. Satan, and therefore Mr. Aczel's wrath reside in the un-holy halls of *Stereophile* magazine. *Stereophile*, and the Demons who lurk there, are all involved in an Evil conspiracy to fool you, dupe you, and steal your money. What Mr. Aczel doesn't realize is that you can't have a real conspiracy unless Oliver Stone has made a movie about it.

According to *The Audio Critic*, "You can't hear the difference if I can't measure the difference." The polar opposite is *Stereophile*, with their philosophy of, "I can hear the difference, can't you?"

What neither *The Audio Critic* , nor

Stereophile address is that I don't care what either can measure or hear. That is why they can stir up all the dust they want. I'll still be building exactly what I like the sound of long after the dust has settled.

As far as I'm concerned, the battle line audio press can do horrible Darwinian things to each other and my ears will not be swayed. I'll stick with my warm and cozy tubes. This is not an opinion, it's a preference. Another preference on my part is an Aragon 2004 sandy amp for my sub-woofers. Good, now everyone can hate me.

While I do believe a distortion meter can help in dialing in a circuit, it is my ears that will ultimately decide whether or not the design will remain in my system. Not your ears, Mr. Aczel, my ears.

If test equipment could tell the whole story, the California wine industry would have HP gas analyzers picking apart good wines so they would know what chemicals to add. Every cardboard box red could then taste like a 1929 Rothschilde at dumpster prices. Test equipment can't tell the whole story as our senses can, so cardboard box wine is still cardboard box wine, and a clock radio is still a clock radio. No meter shall ever be my master! No flowery words shall sway me!

Mr Aczel believes himself a consumer advocate. In this case that means he thinks you're stupid. Without him to lead you, you'd be at best, lost, at worst, duped. The fact is Mr. Aczel is not a consumer advocate, he is a very negative man with an axe to hone. He should be grateful that *Stereophile* exists. If it did not he would have little to say about audio.

I don't know how many VALVE readers have been involved in audio long enough to remember the original *Stereophile*. That was a very different publication from the "Santa Fe Slick" magazine of today. In the old days it was the J. Gordon Holt show, always interesting, usually funny and perpetually at least a year late, (except for the late part, a lot like VALVE) and jammed with typos.

If you like insight into disturbed minds, read *The Audio Critic*. If you want to spend huge amounts of money, (or just like purple prose) read Stereophile. But if you just like audio, read whatever you want, think whatever you want and build what you like.

Most of all, remember the first rule of electronics:

Don't pee on wall sockets.

Back Issues

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Volume 1 - 1994 issues - $20

a Williamson amp; Dyna Stereo 70 mod bakeoff; converting the Stereo 70 to 6GH8's; a QUAD system; triode input Dyna MkIII; MkIII vertical tasting; smoothing impedance curves; Altec A7; Ampexes Nagras and ribbon mikes; Triophoni, a 6CK4 amp; audio at the 1939 World's Fair; books for collectors and builders; V.T. vs. R.M.A. cross reference; FM tuner tube substitutions; Big Mac attack - the MI200; 6L6 shootout; a vintage "audessey"; more FM tuner mods; vintage radio mods; Heathkit rectifiers; PAS heater mod.

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Rectifier shootout, tube vs. solid; FM 1000 recap and meters; single ended 10 amp; triode output W-4; Optimus 990 - speaker for SE?; star grounds; tuner shootout; Living Stereo, vinyl or CD?; World Audio SE integrated; firin' up - smoke checking; Brook 12A schematic; 6C33 vs. 3C33; Heathkit power transformers; 6B4's + MagneQuest = SEcstasy; W5 mods; triode operating points; Dyna restorations; Marantz 7,8 and Scott LK150 impressions; hackable vintage gear; Quasimodo - PP 805 amp; restoring a Scott 340 in 75 minutes; a dream system for 78's; cartridges and styli for 78's; Restoring a Lowther, Part 1&2; easy tube CD output hack; 6ER5 phono preamp; 304TL & 450TH SE operating points; hypothetical DC ESL amps.

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Single Watt, Single Tube, Single Ended, an amp for Lowthers; the Vintage Speaker Shootout of 1996, QUAD vs. Lowther, vs. A7; the Voigt Loudspeaker, the Single Ended eXperimenter's kit; cathode coupled SE 6AS7 amp; how to build the Superwhamodyne; refoaming AR woofers; mesh plate tubes; rebuilding QUADS; QUAD amp filter surgery; single gain stage amps; the Brooklet, and Brookson, choke loaded PP 6080 amps; transformer coupled PP 6DN7 amp; the Iron Maiden; Building the Lowther Club Medallion; the TQWT, a tapered pipe enclosure; IT 300B amp.

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the Whampipe/Hyperwhamodyne; weird interconnects; winding your own SE output transformer; Tapered Quarter Wave Tubes; battery bias; onetuber 417A and 437A amps; DAC attack; 6BL7/211 SE amp; pro sound speakers at AES; 46 plate curves; what's all this about parallel feed?; parafeed line stage; C.W. horn divided by two; Svetlana meets Brooklyn; parallel feed SE 811A amp; parafeed 2A3 amp; Lowther fixes; Altec vs. the competition; VSAC 97 program guide; VSAC 97 photos; Andy Bartha's cool speaker cables; Paul Joppa's 6DN7 driver stage; S.E.X. kit schematic revealed; an Edgarhorn builder's story; direct coupled active loaded parafeed 45 amp; Brainiac's S.E.X. changes; VSAC 97 seminar notes; tweaking the one tube 6DN7 amp, Lowther drivers, and the Wright preamp; 300B S.E.X. amp conversion; mini monitor for 300B amps,

on driving the two channels of a SE amp out of phase

by Bascom H. King
Senior Contributing Editor, Audio

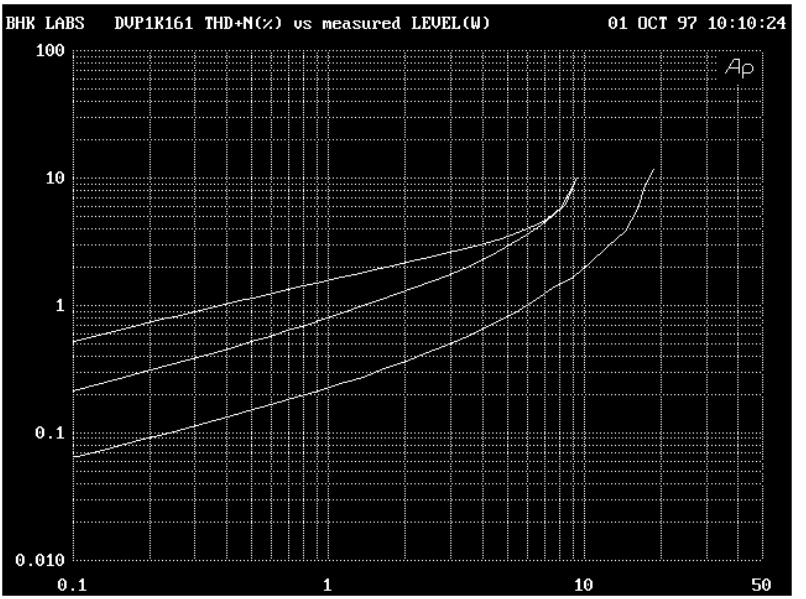
Think of this idea. Each channel of a stereo or pair of mono single ended amplifiers has a similar second order nonlinearity characteristic caused mainly by the single ended operation of the output tube and the DC magnetization of the output transformer core. Now, if one could drive two such channels with the same input signal but out of phase, and take the difference of the outputs, in principle, most of the even order distortions would cancel. This is not really a new idea as such as it has been done with some solid state amplifiers to get greater power output. The two channels of a stereo power amp are set up as described above in what is called bridged mode. I first became aware of this idea in the context of tube circuits from an article in *Glass Audio* Volume 8, Number 3, entitled "Dual Single-ended Amplifier" written by Graeme J. Cohen. In this article, the author shows some input/output curves indicating greater linearity in such a connection.

Why consider such an idea? Several reasons. First, Whatever good sonic characteristic that the SE amp design would have aside from it's intrinsic second order distortion would be hopefully retained. Second, greater power at lower amounts of distortion would be produced. Third, it would be interesting to see if the first and second considerations would lead to yet better sound. For the record, I should mention an alternate idea that would be to merely parallel the outputs and drive both inputs in phase to get double the power output. In such a arrangement, one would connect the output taps together that are half of the load impedance, i.e the 4 ohm taps for an 8 ohm load. In this case, however, distortion wouldn't be reduced in the same way.

As I had recently started to look into SE amps myself, I had the thought of trying out this idea on two different stereo SE amps on the test bench. Unfortunately, I didn't have two such specimens of each type to listen to after testing them in this new mode. My intention here is to show the test results for the two amplifiers and encourage others to try this out and see what the sonic results might be. The two units tested were a Audio Note (AN) Conqueror and an Esoteric Audio Research (EAR) 859. The curves to follow show the distortion vs power for a 1 kHz signal into a 8 ohm load on the 8 ohm output taps for each channel. Additionally a third curve shows the power output vs distortion for the unit driven with each channel out of phase and for a 16 ohm load connected between the hot outputs of each channel. This presents a 8 ohm load to each channel. To be more realistic in terms of what one would actually do with a particular load, I could have connected the same 8 ohm load between the hot 4 ohm tap. Nonetheless, the results should be more or less the same. Fig. 1 is for the AN Conqueror and Fig. 2 is for the EAR 859. As can be seen, the EAR 859 has somewhat lower distortion but, I presume, has some overall negative feedback whereas the AN Conqueror doesn't. In both cases, the overall distortion is reduced and the power output is doubled.

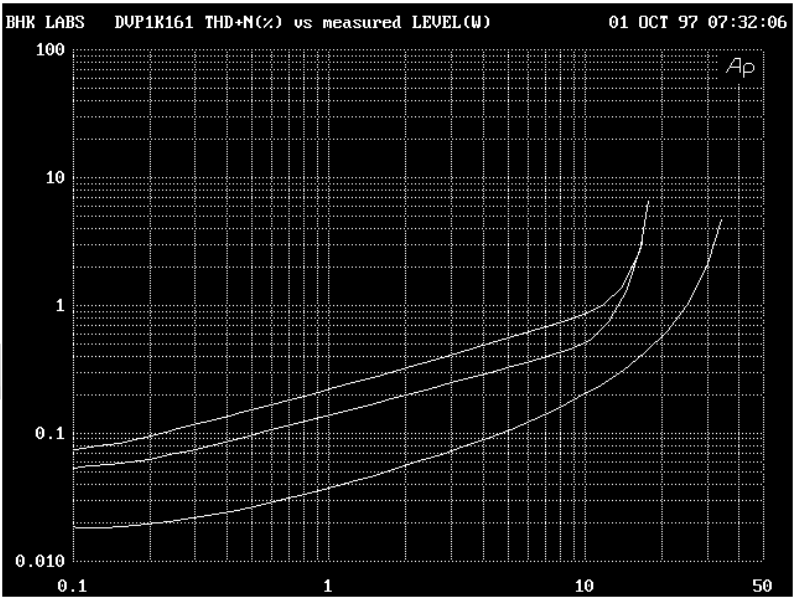
In practice, to listen to amplifiers connected this way, it is almost mandatory to have a preamp or volume controlled source with a balanced output. Otherwise, some sort of a phase inverter will have to be employed. If the balanced source has phono plug outputs, merely connect the two phases of the output to the two inputs of each equivelent channel. If the balanced source has XLR outputs, make up two XLR line female to two male phono plug adapters where pin 2 of the XLR goes to the center pin of one of the phono plugs and pin 3 of the XLR goes to the center pin of the other phono plug. Pin 1 of the XLR is wired to both the outside or shell connections of the phono plugs. These can be made with one's favorite hookup wire twisted together and with the overall length of wires perhaps 4-6 inches long. The preceding assumes that one uses balanced cables with XLR connectors on both ends to connect the preamp output to the amplifier inputs. In order to preserve overall absolute phase for the setup, when conecting up the inputs of the pairs of amplifiers to be an equivelent channel, associate the phono plug from pin 2 of the XLR with the hot output of that channel of the amplifier being the plus lead to connect to the speaker. The other speaker lead, of course, is connected to the hot output of the other channel of the amplifier pair. It is also necessary to connect the low sides of the speaker outputs of each amplifier channel together.

Fig. 1: Audio Note Conqueror, at 1W level from top to bottom; Rch, Lch tested separately, difference between hot



output terminals

Fig. 2: Esoteric Audio Research 859, at 1W level from top to bottom; Lch, Rch tested separately, difference between



not output terminals

An interesting e-mail exchange between Brainiac and VALVE photographer Tom Vetromile

Listen, I need some direction on this SE 6DN7 Para Feed Topology...You know the Dyna SCA-35 Output Transformers Primary Impedance might be as high as 8000 Henrys. In push pull with EL-84's, I think they are 4000 Henry's....? These Transformer numbers are Z-565's....Anyway, I would like to learn the "Methodology" (a linear order of steps to figure what a combination of Driver vs. Output) of 3 possible schematics... 1- 6DN7 "Driver" w/ 6DN7 Output, 2- 6DN7 "Driver" w/ 6S4A Output, and some "Driver" and KT-90 Output----all SE Para Feed Topology.

TV

Tom,

Your email came at an opportune time; I've just been putting together something on parafeed component values. I'll put something at the end of this to outline a "Methodology". I've cc:'d Dan because we've talked about me doing a bit for the amp class in April. I'm thinking of doing something like this, with my article on operating points as the textbook, which can be published at or after the class (benefitting fromfeedback from people who try to use it!)

I'll do this in the form of an example for a single 6DN7; then you can try to do it for other output tubes & see how it works. This is just the output stage right now; we'll worry about the driver later. Let me know how it works!

-Paul

Parafeed output stage design for 6DN7 and 8000 ohm transformer ==========

Step 1: We'll start with the operating point, by which I mean the plate-to-cathode voltage, the plate current, and the load impedance.
First, some definitions: R0 is the DC operating resistance, or plate voltage divided by plate current (Eb/Ib). RL is the load impedance (8000 ohms in this case). rp is the plate resistance as specified for the output tube (2000 ohms for a 6DN7). A good operating point, which we are looking for, will have

$$R0 = RL + 2*rp, \quad 4*rp < R0 < 10*rp$$

Step 1A: Given RL, find R0: rp for the 6DN7 power triode is 2000 ohms, so R0 = 8000 +

2*2000 = 12000. This is 6*rp, so this is a good point.
Then find Eb, Ib such that Eb/Ib = 12000 and the power dissipation PD = Eb*Ib is no more than 10 watts (max according to the tube specs). The formula is

Eb = sqrt (R0*PD) Ib = PD/Eb

or Eb = 346.4 volts, Ib = 28.9mA.
Note: you should check at this point that Eb does not exceed the maximum plate voltage for the tube; the 6DN7 is good for 550 volts so we're fine.

Step 1B, 1C: There would be a different procedure if we started with Eb or R0 instead of RL; I'll have to fill those in later.

Step 2: Now we'll design the rest of the output circuit, the cathode resistor Rk, bypass capacitor Ck, and grid resistor Rg. If you have tube curves available you can look up grid voltage Ec for the given Eb and Ib; then Rk = Ec/Ib. Otherwise this formula is a reasonable approximation

Rk = (R0/mu)(R0/(R0+2*rp))

or Rk = 584 ohms (mu is 15.4 for the 6DN7). If you have Rk, then Ck can be found from

Ck = 65000/Rk in uF

or Ck = 111 uF. Of course you'll round these to standard values, maybe 560 ohms and 120 uF. Check the power dissipation of Rk, power = Ib*Ib*Rk or 0.488 watts. I'd use at least a 1-w resistor and preferably a 2-w resistor because tube amps are hot and resistors won't handle their rated power at high ambient temperatures. Also at this point check the bias voltage Ec = Ib*Rk, 16.9 volts in this case. Then Ck must be rated 20 volts or more. For the grid resistor, first look up the tube specs if you can. Often they will specify a maximum value. Otherwise you have to guess. Often the max value is 500kohms; I like to use no more than half of the maximum for a safety margin so 250kohms is it. (Round to a nearby standard value, say 270kohms). Power tubes, especially pentodes/beam tubes often have a smaller value like 100kohms specified; if it's that small you can't afford to have the safety margin. This value is important in driver design; you want it to be at least 20 times the driver tube plate resistance.

Step 3: Finally, we can design the output part. The low frequency power limit determines the plate choke ("retard coil") inductance. For a

(Continued on page 18)

powerin'up the Blues Master

a basic power supply design for getting the VV32BC parafeed amp up and running

On to the Power Supply

There are nearly as many ways to design a power supply as there are to design an amp.

A power supply needs to do two things well. It needs to supply volts and current with alacrity, and it needs to be very quiet in the process. Herein we'll design a very basic supply, with the hopes that some of our talented readers will offer refinements (you listenin' Buddha?).

Let's look at the first part of the problem.
We need to get about 700 volts to the plate of our VV32BC. What we need to get from the high voltage secondary of our power transformer in order to eventually hit this number is determined by several factors.

First, whether we use a capacitor input or choke input supply. Secondly, the voltage drop across the rectifier and any "slow start" device we may employ.
Thirdly, the voltage drop across any filter chokes.
Fourthly , the voltage drop across the B.A.C. plate loading choke.

OK, I'm going to arbitrarily decide a few factors here, and then see what commercial power trans might work for us.

How much raw voltage?

We have already calculated that we need about 200V for the driver stage, plus 80V bias between the grid and the filament of the VV32BC, plus 410V between the filament and plate of the VV32BC, so our total voltage requirement to that point is 690V.

The MagneQuest B.A.C. has a DC resistance of 214 ohms, so, at 80mA, we'll see a drop of about 17 volts across it. 690+17=707V, so we need to see 707V at the output of our power supply filter.

The Filter

Let's see if we can design a choke input filter for this amp, which should give us the best sound short of designing a complex shunt regulated supply, and protect our spendy VV32BCs a bit from the kind of slammin' voltage that hits the plates when a cap input filter charges on startup.

For a filter choke, low DC resistance is a good thing, the lower the resistance is the quicker

power supply may react to changing demands of the amplifier stage .
How about a Brooklyn BCM 19, rated 10H at 200mA with a low 109 ohms of resistance, which would give us a voltage drop of 109 ohms X 0.08 amps = 8.72 volts.
That puts our secondary voltage requirement up to 707V+8.72V=716V
A good choke input filter requires two chokes (don't these guys who design choke input filters with only one choke ever read the ARRL Handbook?) so let's figure another drop of equivalent magnitude , 716V+8.72V=725V.

Now we need some filter caps after each choke.
Arguments continue to rage on about big caps vs. little caps. I don't have a definitive standing on this, but remembering that this sucker is going to swing up to at least 725 volts as that first capacitor charges up, we have our choices narrowed quite a bit by the voltage rating requirement. I like oily filter caps, and Mouser has a 30 mfd CDE oil cap rated for 660VAC, part number 5987-660V30. Use one or more of these after each choke, to taste.
As usual, choose your own poison if you don't like my ideas.

Save them filaments!

One problem we create for ourselves when we use solid state rectifiers is that at turn on the B+ slams the plate of the output tube while the filament warms up, stripping the filament and wearing the tube out.
So we shall borrow and idea most often credited to J.C. Morrison, and insert a damper diode in between the rectifiers and the first filter choke, which warms up slowly and delays the passage of B+ to the output tube for 10 or so seconds, preserving our investment in VV32BCs.
I haven't used this idea myself, so I'll take a guess that a 6AU4 will do the job nicely, most of the available tubes seem pretty close in spec, and I know the 6AU4 is a fairly common type.
I couldn't find much definitive info on exact voltage drop for a given current draw, but it would seem they range around 20-30V. Let's figure 25V to play the averages, and add this to our required raw voltage, 725V+25V=750V

Rectifier

I guess I already played my hand on this, we're using solid state rectifiers.
Here's one of those areas where I will rely on my ears. Solid state rectifiers can really ruin the music.
Except the super fast recovery soft start recifier diodes. They seem to have all the musicality of tube rectifiers, with quicker attack and faster bass. Running into a choke input filter, they seem to sound their best.
My eXperiments with rectifiers always bring me back to this conclusion, so I'll pick a soft start fast recovery diode to use in a full wave bridge configuration.
How about HexFreds - we'll use the TO-247AC/MOD units from Digikey, PN HFA16PB120-ND.
OK, so now we know the voltage drop across the rectifiers will be negligible, probably around .7V each.

Choosing a power transformer

OK, we need to examine our power transformer requirements.

First off, we need to find about 750VDC.

Remembering that we are using a choke input filter, we need to find a high voltage secondary that can supply voltage based on the rule of thumb formula of

$V_{\text{choke input filter}} = .9\ V_{\text{secondary}}$

or $V_{\text{choke input filter}} / 0.9 = V_{\text{secondary}}$

so we get $750 / 0.9 = 833V$

Sooo, we need secondary voltage of about 850V center-tapped, a.k.a. 425-0-425, rated for 2 x 80 mA = 160 mA, since are using a full wave bridge.

For the five volt filament we need a 5V center-tapped winding, rated for 2 amps.

For our 6.3V winding we have the demand of the 6BN4A heater, 0.2 amps, plus the demand of the 6AU4 dampr diode, 1.8 amps, for a total demand of 2 amps.

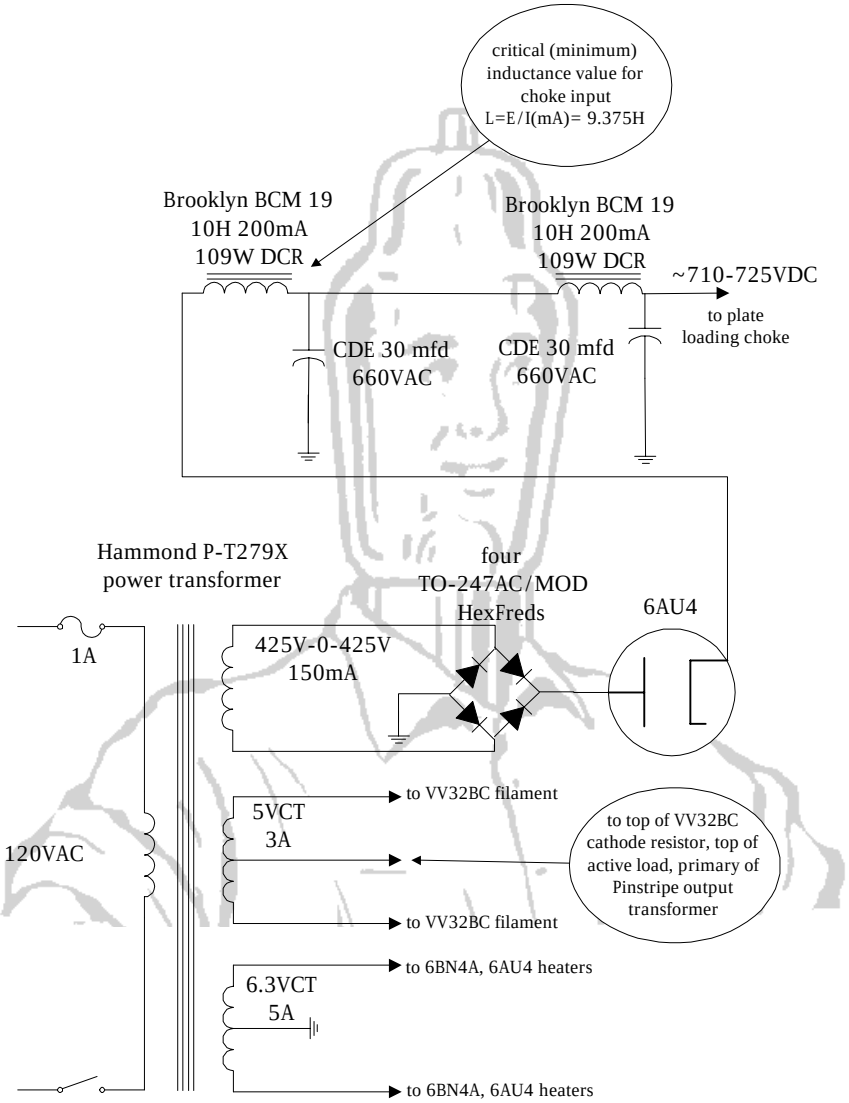
Well, there is a Hammond power transformer, number P-T279X, that will easily meet our specs,

425-0-425V, 150 mA
5VCT, 3A,
6.3VCT, 5A

The secondary current rating is a bit low, but we have so much current headroom in the two filament windings, this shouldn't be a problem.

Hooking it all together

The Blues Master - basic power supply



The secondary hookup is a pretty straightforward full wave bridge setup. Mind ther diode polarity!

The VV52 filament should connect to each end of the 5V secondary, and the center tap of the secondary ties to the top of the VV32's cathode resistor. Here's a little trick from Lynn Olson: twist the filament leads going to the tube, and run that twisted pair inside a shield. Tie the shield to the centertap, and then tie the centertap to your star ground. This will do a marvelous job of killing stray hum.

The 6.3 volt winding is a little tricky, because both the 6BN4A and the 6AU4 need to have their heaters within a certain range of potential relative to their cathodes.
The 6BN4A cathode is sitting at about 3V, and the 6AU4 cathode is sitting at about 735V.
Luckily the tube manual says we can stand up to a 900V average differential between the heater and the cathode of the 6AU4 (most tubes allow about 100V), so we should be OK with both tubes if we tie the 6.3V centertap to ground. If you are skittish about this, by all means add another 6.3VCT transformer to power the 6AU4, and float its centertap at B+.

Klipsch downunda

Just thrown another shrimp on the barbie on this 95 degree downunder day! Chistmas and New Year Wellwishings to you and your team from this contented subscriber. Long may your filaments glow. Yeek! Shock-horror.Hair wrenching all around! My October copy of 'Valve' never arrived, an absence highlighted by the November copy chirping joyfully from my mailbox the other day. Please, Doctor B., I know its probably not your fault,but could you see to popping another #10 in the mail? I kiss your little nickel-plated anode connector in anticipation! [my other, pre-SET, amp is a pair of Tim de Paravicini's 549's, using PL509/519s , so I know all about keeping flesh, moist or otherwise, from cute little bottle-heads like yours when they are hot! The above 549s were the Pinnacle of my power hungry phase [following the other sheep] using Martin Logan SL2s. They were pretty good but had a very low fiddle factor [I can't resist fiddling] as MAJOR devaluation ie. unsaleable, would follow any worth while tweaks. I had heard about the low-power route so bought an old pair of Klipsch Cornwalls to keep my itchy fingers happy. Wow!. Some things were really good. I loved the new dynamism and vowed to tweak my way to heaven down this new road. I swapped the Logans for a really good CD player and was on my way. I stripped out the drive units, building a tight box around the mid-range with the compression driver stuck out in fresh air. The box is sand filled. The 15 inch K33 driver is front-mounted on a rear-horn loaded box with a snail-shell mouth [23 inch square]. It resembles a less tortuous Lowther box, as the rear load just goes down up, down and out.This 40 inch high box has a low wife-acceptance-factor, especially as the sand-damped midhorn is then mounted vertically in a time-aligned position on top! The existing cross-over has the bass section dissected out for bi-amping and is externally mounted. As is, the bass\mid section still benefits from the mid-horn having a baffle. The tweet is on this and the whole slides fore and aft to give the best cross-over effect. Yes, this means the tweet is not time aligned at present. The speakers are bi-amped at the moment with paralleled 2a3 SET. monos on the mid-highs. the plan is to eventually tri-amp and to eliminate the passive x-over by using internal circuit mods in the amps to limit various bandwidts. Maybe then I can get rid of the midhorn baffle and time align the tweet. Hoping this is of interest to you. By the way, anxiety over the quality of my efforts led me to buy a pair of 1982 metal-mid La Scalas. My tweaked Cornies thrashed them! I built sand filled boxes for the La Scalas mids and plopped them atop my bass-bins. Time aligning is an untried engineering nightmare but a poor midrange blend [overfull, whichever x-over I tried] stopped that attempt. The La Scalas now sit in my TV system, newspaper and sand filling the upper chamber with the x-over mounted externally. A push pull 2a3 whets their whistles. Yes, Klipsch owners, do remove the bug-screen from your midrange drivers but leave the tweeter screen untouched. If harshness still troubles you, dont use anything but SETs. on the mids and highs. All the best to your kith and kin.

Phil Nelson

Welborne Labs

Capacitor Spectacular

The ELNA Cerafine blowout continues (we've got the overstocked blues):

Includes clamp			(Retail)	Quantity	1	5	10+
LOA47	47uf + 47uf	500V	($18.00)		$14.00	$13.00	$11.00
LOA100	100uf + 100uf	500V	($28.00)		$22.00	$21.00	$19.00

The Arizona Capacitor closeout (couldn't deal with the manufacturer):

Paper in Oil caps with axial OFC leads. $2.50 each any value.

AZ02	.01uf/400V	AZ13	.01uf/600V
AZ03	.022uf/400V	AZ14	.10uf/600V
AZ07	.10uf/400V	AZ15	.22uf/600V
AZ08	.22uf/400V		

NOS Oil Caps (while quantities last):

GE Radial Oil Cans	74uf/440Vac/750Vdc (about the size of a beer can)	$8.00 each
Sangamo & CDE Radial Paper in Oils	2uf/600V (I feel the need for parafeed)	$4.00 each
Sprague Radial Oil	.1uf/1500V	$0.75 each
Sprague Bathtub Oil	2 x .1uf/600V	$0.50 each
Potter Radial Oil	.5uf/400V	$0.50 each

Nippon radial snap mount electrolytics: (120uf/400V) $0.50 each

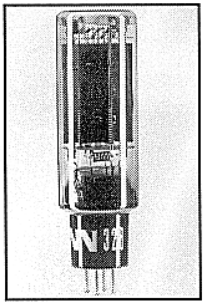
Hovland MusiCaps (what the hell...put'em all on sale):

20% off all values!

The KR Enterprise VV32BC sale has been extended (get'm while they're hot):

Retail price is $775.00 per pair. Special limited time offer to Valve subscribers only. $525.00 per pair.

We still have some KR Enterprise VV52Bs with the old Vaic Valve logos in stock. Only $425.00 per pair.



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contact: Welborne Labs
P.O. Box 260198 Littleton, CO 80126 USA
PH: 303.470.6585 Fax: 303.791.5783 E-Mail: wlabs@ix.netcom.com

Brainiac on the VV52

Paul and I had a phone conversation about the power output claims by KR Enterprise in their published curves for the VV52 (24 watts at 450 volts and 150 mA into 2K with less than 0.1% THD). I have been getting about 12-17 watts at 5% THD into 3K and less than 0.1% TD at 1 watt at various operating points around 400-480V and 130-160 mA with my own VV52s. Here's what Paul ended up calculating for a 3K load-

Dan-

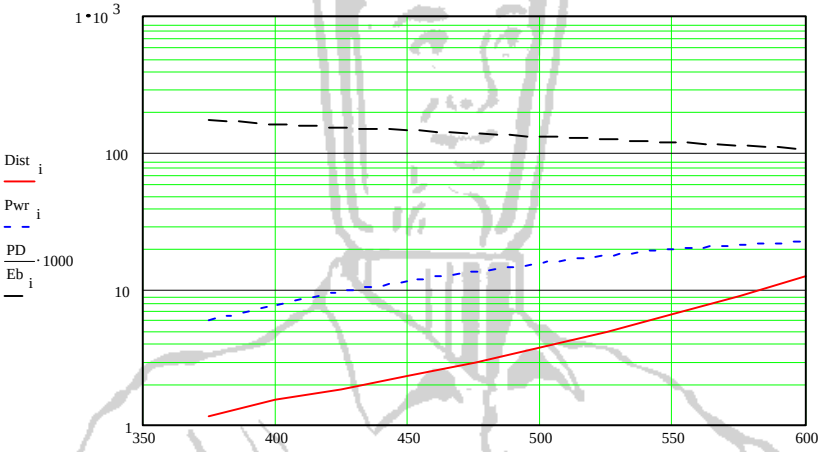
Attached is the calculation I promised. This shows power, distortion, and quiescent current as a function of plate-to-filament voltage for a low-distortion triode (NLF=0.05) of 600 ohms plate resistance, running 65 watts plate dissipation, into a 3000 ohm load.

Note that at 475 volts / 137mA you get 13.5 watts at 3% second harmonic - very clean, though not very efficient at 21% (*this agrees pretty well with my own findings - B.*). You could get 17.5 watts at 5% (525v) or even 22 watts at 10% maximum second harmonic with ~585v.

I wonder if the low-distortion operating point might be a good part of why this amp sounds so good, rather than the parafeed output? You could try running 480v/91mA to get more tube distortion & see...

-Paul

I think it's the combination of both. The low distortion certainly contributes to the clean sound, but the parafeed adds a great deal to the sense of bandwidth and resolution as well



Eb =

	0
0	0
1	375
2	400
3	425
4	450
5	475
6	500
7	525
8	550
9	575
10	600

Pwr =

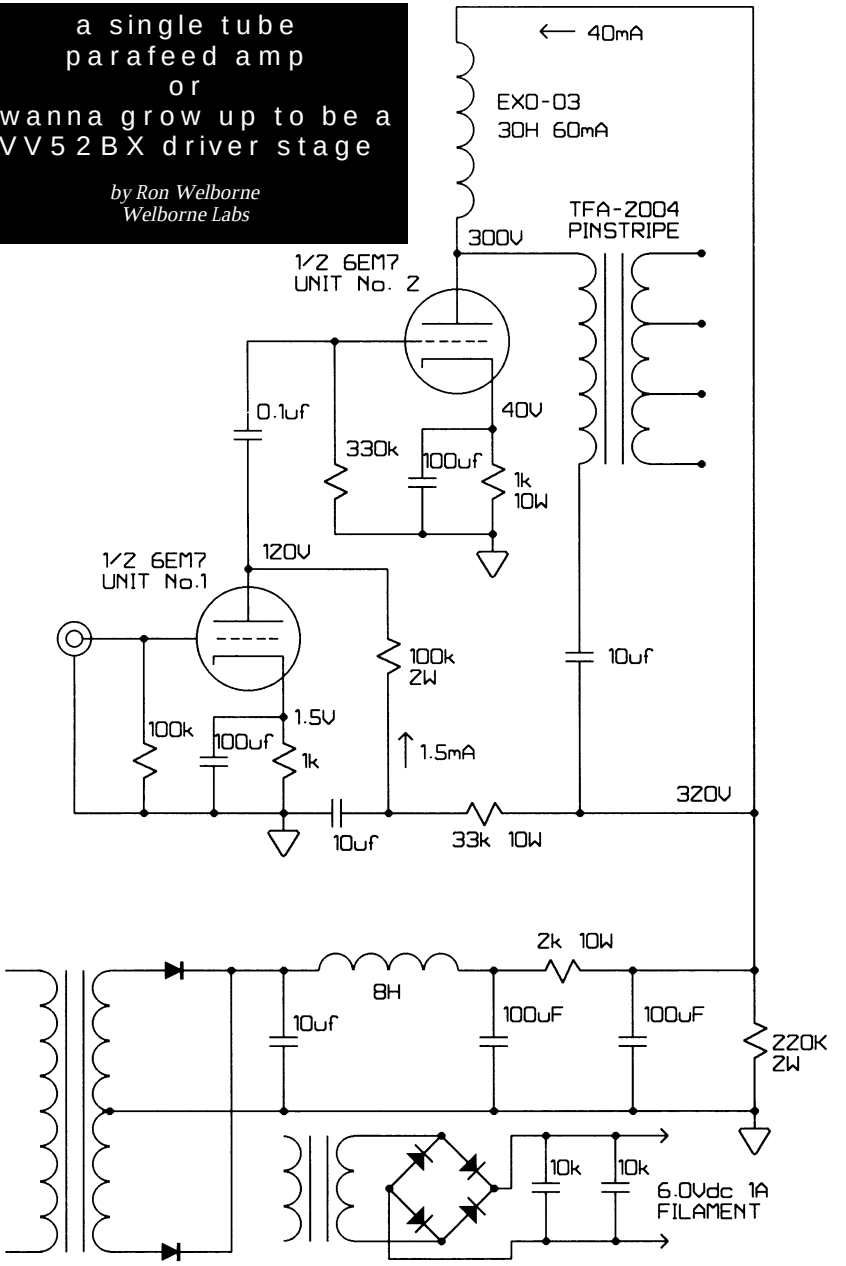
	0
0	0
1	5.976
2	7.66
3	9.505
4	11.46
5	13.501
6	15.6
7	17.665
8	19.598
9	21.239
10	22.437

Dist =

	0
0	0
1	1.165
2	1.535
3	1.844
4	2.313
5	2.933
6	3.714
7	4.852
8	6.491
9	8.905
10	12.341

a single tube parafeed amp or I wanna grow up to be a VV52BX driver stage

by Ron Welborne
Welborne Labs



After listening to the KR Enterprise VV52B and Vacuum Transistor amplifiers again at the '98 winter CES show I was really motivated to build a 52B amp and besides that, I continue to get at least one phone call per day from individuals interested in taking the SE amplifier plunge yet they don't want to give up their favorite 86 dB speakers. So I decided now is the time to build an SE product with some power!

This design is intended to be a driver stage for my new SE 25 watt VV52BX (or possibly Vacuum Transistor) power amp. While waiting for Electra print to wind the high current output transformers I decided to prototype the driver circuit and take measurements. Then, I remembered I just happened to have a pair of Mikey's TFA-2004 Pinstripes laying around as well as a pair of his EXO-03 plate loading chokes, so I said "What the hell, I'll make a single tube flea powered parafeed out'a the thing and see what this circuit sounds like."

The driver tube is a 6EM7/6EA7 which is a glass octal dual triode originally designed for use as a combined vertical deflection amplifier and oscillator in televesion receivers. Unit No. 1 is spec'd with a mu of 64 at 1.5 watts and Unit No. 2 with a mu of 5.4 at 10 watts. With these specs the tube looked like a good candidate for both voltage swing and current drive. The second setion of the tube has a plate resistance of 750 ohms which is perfect because I plan to use an interstage transforner between the driver stage and the VV52BX output tube so the low plate resistance will help out in the bandwidth department.

As designed, this parafeed amp produces 3 watts of output power with frequency response measurements that are down 3 dB at 2 Hz and 42 kHz. Plenty of power for my Medallion II speakers. I used Motorola ultrfast rectifiers in the power supply because this same supply will eventually be required to power the VV52BX tube which is capable of current peaks approaching 8 amps.I didn't want a tube rectifier squelching this power capability. I also rectified the filaments for the 6EM7. With AC filaments I measured 1.5mV of hum on the outputs which is unacceptable for me, so in went the DC circuit. With DC filaments the measured output hum is less than 0.4mV. Now the only noise heard through my Lowther PM2As is tube hiss.

Sonically this circuit is awesome. In fact, it gave my Moondog 2A3 amps a run for their money. It really added more life to vocals and the midrange might actually be a little sweeter then the 2A3s. The Moondoggy amps help up better under heavy demands though, with the bass being more solid and better defined. All in all this turned out to be a great little amplifier and with a little massaging it should easily blossom into a nice sounding driver stage too.

While not prototyped at the time I'm writing this (waiting for the Electra Print OPTs) the plan is to replace the TFA-2004s with an interstage transformer. Nothing concrete yet on the interstage transformers, but I will be auditioning units from Magnequest, Electraprint and Lundahl. The interstage transformer will directly drive the KR enterprise VV52BX tube, which will be driving the Electra Print VT2KB output transformer. The VV52BX will be operating at approximately 150-170 mA with a plate potential of 400V which should provide a power output in the neighborhood of 20 to 25 watts. If I'm able to lay my hands on a pair of the Vacuum transistors the above current would be doubled and I would have to step up to Electra Print's big bruiser E48B output transforemr. But I'll cross that bridge if and when I get to it.

While messing around with this circuit, I tried direct coupling the two halves of the 6EM7, but lost too much voltage swing to get any kind of output power from the parafeed amp. A direct coupled design might provide enough swing to drive the 52BX so I will most likely revisit this configuration, however I fear I will need all the voltage swing I can get in order to obtain 25 watts. If necessary I can live with one capacitor in the signal path... they sometimes make a nice tone control if you know what I mean. I'll also be able to back off on the current through the No. 2 half of the 6EM7 from 40 mA to 30 mA or maybe even 20 mA since once again I will be driving a tube instead of a speaker.

I'm pumped up now and can't wait until I get the new OPTs. The only problem I forsee is I dan't have any inefficient speakers to try these amplifiers on. I guess I'll have to tuck them under me armpits and carry 'em down to the local audio salon for a test.

You know, I've had those Pinstripes sitting on the shelf since VSAC wondering what I was going to do with them. Now I know. This little parafeed amp might make a killer headphone amplifier too....hmmmm.

(Continued from page 8)

power capability down to 40 Hz, the formula is:

Lc = RL / 250.

In this case, Lc = 32 Henries. (Fortunately this is about the inductance of the S.E.X. kit output transformer...) (Incidentally, I think you will get better sound with more inductance here, but this is the minimum) The choke has to handle AC as well as DC current, so if you are using a choke rated for power supply use then its rated current should be 2*Ib, in this case you need a 32H choke rated for about 60mA (fortunately again, the S.E.X. output is good for about 65mA according to my measurements). Note that a choke properly rated for plate load use will generally be rated for a given Ib, already having made allowance for the AC current. If the choke was not originally designed for plate load service, you should check its leakage capacitance; the self-resonance should be above 800 Hz. (The S.E.X. output resonates at 4300 Hz, so it's fine.)

Finally, the coupling capacitor depends on the inductance of the choke Lc and the output transformer Lo. I don't know the Dyna, so I'll guess it's 500 Henries. There are two capacitance values, associated with the two inductances. You can usually get away with any capacitor between these two limits. The formula is

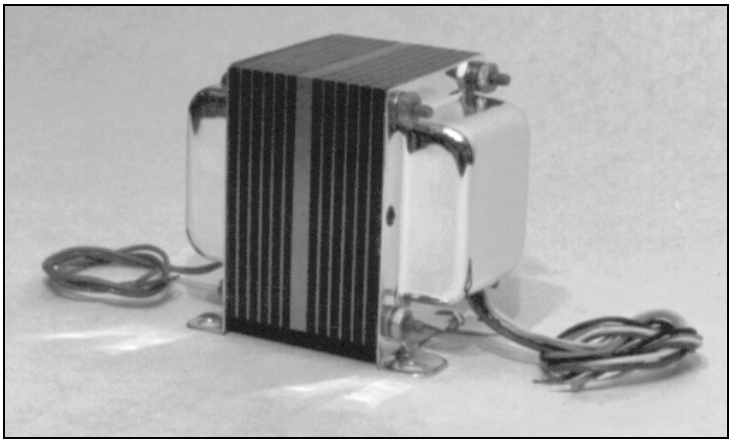
C = L/(RL*RL)

so for the example, C is from 0.5 uF to 7.8 uF.

OK, now the output stage is designed. Now you can build it and start eXperimenting ...

Paul

THE PINSTRIPE



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Hyperpinstripe version, shown above, with nickel "sandwich", $250. All nickel TFA-2004 also available , $275 each with solid brass bell ends

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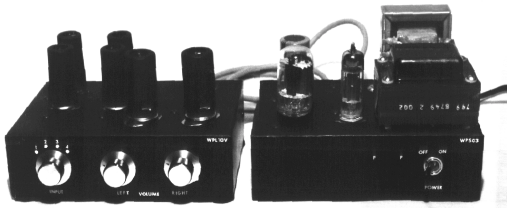

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