

# VALVE

VINTAGE AUDIO LISTENERS AND VALVE ENTHUSIASTS

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**Big ol' toobs -**

**304TL redux & 450TH**

**Hypothetical ESL amps**

**Quieting noisy transformers**

**Dream systems**

## **upcoming meetings**

Holiday Party  
December 3, 1995  
At Electronic Tonalities, Poulsbo

Ultimate Vintage Speaker Shootout!  
QUAD vs. Lowther vs. Voice of the  
Theatre  
January 7, 1996 12 Noon  
At Electronic Tonalities, Poulsbo

**volume 2  
number 12  
December  
1995**

# VALVE

*is the newsletter of*

Vintage Audio Listeners and  
Valve Enthusiasts,

*dedicated to the preservation and  
dissemination of thermionic valve  
and vintage audio knowledge.*

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## editor's thing

Merry Holidays!

Made your wish list yet? In case you're trying to figure out what to buy the editorial staff, Dave, Doug and I have made our dream vintage and homebrew system lists. See page 12.

Now I know that it's pretty futile to put audio stuff on your spouses shopping list - "I'd like a matched quad of used Mullard EL34's, and make sure the getters are OK, hon..." - so I suggest an end run to this approach.

Ask for a pair of socks. That's it.

Come August, you'll have less trouble spending the rent money on that rusty Mac 30 you found at the radio club swap meet. Your better half's guilt from buying you such a crummy Christmas present will be your saving grace.

Oh yeah, be sure to unload that trunkload of Knightkit mono tuners someone laid on you at the last ham swap while you're there. The length of the average relationship is inversely proportional to the amount of junk piled up in the basement.

Speaking of presents, I have one for all you full members who have stuck out the kinda high dues I've been forced to ask while we got rolling these first three years.

The distinction between full members and subscribers has become rather fuzzy in the last year, as we have several subscribers showing up at meetings, while many full members find the trip to Poulsbo meetings a bit much.

While this has gone on, newsletter costs have crept up. Postage increases, film processing, and rising photocopy prices continue to make this a break even venture at best. I might mention that part of the reason for this is that we remain very exclusive, with a total circulation of about 60.

I suspect that we could become a better platform for the sharing of ideas with an

expanded circulation. This means advertising, and that means yet another drain on the VALVE checkbook.

We have been receiving kudos for being the only timely, monthly tube audio mag, as well as for having a broad range of 'levels of difficulty' and representing a serious group of experimenters.

I'd like to keep the format, and get more folks reading it, without nuking the club aspect (you Triode Society guys are always welcome to visit!).

Sooo, I'm raising subscription rates to \$25 per year to alleviate the increased expenses.

As a gift to you full members, I'm pushing your current membership expiration from July 1996 to the end of the December 1996.

In 1996, membership will be automatically given with your subscription, expiring whenever your twelve issues have been delivered.

With expanded circulation the newsletter may become a viable medium for advertisers. I'd be interested in hearing if the subscribers would like to see ads in VALVE. Let me know.

What I need to ask in return from the active members (maybe even moreso from you inactive members) is a lot of help planning and executing meetings.

You may recall that I offered to run it all at the \$35 a head price. With the lower member dues, I am seriously disinclined to carry the bulk of the load. Over the past months Dave and Doug have made generous contributions of time and energy for the rest of the membership to enjoy. How about giving them a little help?

We have *triple* the attendance at Seattle meetings that we have at Poulsbo meetings, even though the Poulsbo meetings tend to be more interesting. Can't someone PLEASE find us a good meeting site in Seattle? We need really good acoustics, security, and room for 20-30 people.

Don't let the VALVE's smoke out,

DAN

## letters from fred

by Fred Suffield, P.E.

When one acquires an old tuner, amplifier, or radio, the first thing to do is remove the tubes, mark the sockets and make a sketch of the tube location. Check the types you remove against any chassis marking or data sheets you may have. Substitutes may have been made, and possibly some circuit values changed.

Note condition of the chassis, variable pots and capacitors, looking for signs of overheating. Remove the chassis carefully from the cabinet, making a note of hardware and location.

Identify any parts that look burned or overheated. Replace all electrolytic capacitors as a general practice. Check the color of wire, repairs may be evident. Check the power line cord for shorts or opens, and see whether the resistance of the primary winding of the power transformer seems adequate, or if there is a short.

With a fuse in the line, use a Variac and AC voltmeter to start with about 25 volts from the power line and see if there is voltage on the plate and filament terminals of the rectifier socket. If there are no signs of smoke, or shorts or opens, let it run for an hour or more. Then run the line voltage up to say 50 volts. Recheck the output of the power trans and watch for overheating. Remember, still no tubes, so the filament voltage may appear high, that is OK.

After another hour or so, if all is still cool, put all the tubes in except the rectifier. Run the primary up to 115 volts, checking filament voltages and voltage of the rectifier socket plate terminals. If OK, let it run and dry out.

Now put a good rectifier in and put a DC voltmeter from the rectifier filament terminal to ground. If all is OK, run it a while longer. The secret, move slowly and carefully. The extra time spent is better than the time spent finding a replacement power transformer!

## what's brewin'?

Am closing in on the 211SE project, at least in a breadboard version. Will use the Orfeo circuit from Sound Practices; a 417A direct coupled to a 10Y (I'll use a Sylvania 210/801 with a graphite plate) which will be RC coupled to the 211, playing an Audio Note 211 trannie. Power for the 211 will come from one of the Quasimodo power supplies, which use 3B25 rectifiers. Power to the input and driver tubes will be supplied by Stan's Sorenson regulated supply.

I may also try a screen driven 6GW6 or 5881 as a driver. Supposed to be very linear, even more than triodes.

Put together some other speakers this month to compare against the Whamos, as the Magnepans were all I had for regular A/B work. Built a pair of 0.12 cu. ft. vented boxes with Dynaudio D-28 tweets and Audax HM130ZD Aerogel 5.25" woofers, about 91dB. Nice for little bitty satellites. Also matched a 16 ohm 6.5" poly woofer with an 8" Newform ribbon tweeter (11 ohms) about 86 dB. Very nice, very clean tip top frequencies, but a bit laid back and distant in the upper midrange/ lower treble? Also found it necessary to crossover gently from about 3kHz down to level out a broad peak from 1.2 to 2.5 kHz. It's on their published response curve, and, I think, quite audible, although they don't seem to compensate for it in their own line of speakers.

None of these pricey drivers has weaned me off the Whamos. Each has a certain characteristic (like speed, or detail) that might be a bit better, but the Whamos win hands down for overall realism, presence and dynamic excitement.

Also been playing with Minimus 7 mods. Amazingly good little speak if you completely rip out and redo the crossover. I'll play some of these speaks at the meeting. Some will be for sale.

## dinkin' around

### *Cuttin' the buzz*

Tim Lollar called this week with a neat fix for noisy power transformers. Tim purchased the AES SE-1 kit amp reviewed in Sound Practices a few issues ago. No, not a new SE-1 kit, I mean he purchased the *actual* amp that was reviewed. Didn't get all the details, but I imagine it's an interesting story. Anyway, he said the power trannie hummed. I suggested the usual stuff, tightening the mounting hardware, rubber washers under the mounting flanges, putty in the end bells.

Tim called me back the next morning to let me know that some isolation mounts designed for model boat engines solved the problem. I believe the brand name was something like Akura(?). Will verify the name when I find Tim's phone number!

The mounts went in with only a slight enlarging of the mounting holes to accommodate the 8-32 screws (up from the original 6-32). He said the difference was quite amazing.

Not only was mechanical hum way lower, the mounts eliminated the "Twaang" the trannie made when turned on.

Will print more info in a future issue.

### *Triodeing the MkIII*

Doug has this follow up to last month's dinkin':

"Regarding my quick triode mod of the ST-70 last month: It also works on Dynaco Mark III's (6550 output tubes). There is still plenty of power, and the sound is a bit warmer and more detailed."

## a month with the Wright preamp

Last month's meeting brought together an AR turntable with a Shure V15 IV cartridge, my Triophoni PP 6CK4 amps, the Superwhamodynes (with a bad crossover design I rejected soon after the meeting!) and George Wright's phono preamp at Classic Audio.

My impressions of the preamp at the meeting were severely colored by the room, the funky crossover, and the V15. Frankly the presentation of the system was too dull and distant. I thought it might be the preamp itself, but I put in my Precision Fidelity C7 instead and it sounded even more dull!

George generously offered me the loan of the preamp for a while. This allowed me to listen in my usual environment, with my usual equipment. Boy, did my opinion change about this preamp.

After reworking the Whamo's crossover to its absolute best configuration yet (they are way more present, quick and focused), I felt ready to compare the Wright preamp with the C7.

Using my moving coil cartridges brought back a lot of the detail and high frequency sweetness I found lacking at the meeting. I know the V15 is a good cartridge, but I guess I'm a dyed in the wool moving coil type.

I used my Denon DL-103 with a Denon step up transformer on a Denon DA-305 arm and DP-6000 table, and my Audioquest 404 on a Grace 747 on the same table.

One thing I found interesting was that the Audioquest, which I usually find too harsh, was calmed down quite a bit. The paradox here is that the Denon sounded brighter than with my other preamps, even though it was still considerably warmer than the Audioquest. I ran some response curves using Dave's HP analyzer, and found that the only difference of note was a slight increase in the C7's

response compared to the response of the Wright preamp in the 100-300 Hz region. This pretty much corresponds to my impression of a warmer presentation by the C7.

After a month I would say that there is some more detail, coming out more cleanly from the Wright preamp, and the leaner response gives more sense of the very highs and very lows. It also brings out enough more ticks and pops to force me to put my Burwen Transient Noise Eliminator online for worn vinyl.

I really like this preamp. You gotta turn up the volume all the way before you finally hear a teeny bit of noise.

The presentation seems really clear, cleaner than the C7 or my heavily breathed on Citation I. I would attribute it to the frame grid tube, as it exhibits the same smooth but clear and clean presentation as my frame grid tube CD output stage. Both preamps have regulated supplies, and the CD preamp was much warmer and softer with 12AT7's than it is with frame grid tubes.

Dave has some corrections to last month's article.

First, on page 7, the grid of V4A is hanging in space. It should be tied to the B+. Second, T1 in the parts list on page 11 has a 6.3V, 2A secondary, as well as the 650-700 Vct, 50 mA secondary.

George suggests putting a tube shield over the OB2 to keep noise down. Remember to use the kind that lets a little light in through the top, as gas regulators need a few photons to get going.

George also commented that the slight brightness I heard might be due to his using a .003 mF cap for C5 and C5' in the RIAA network. The original RCA circuit called out a .0033mF cap, which he thought might trim the highs a bit.

There wasn't enough room in last month's issue to print the 6EM7 and 6ER5 data, so here it is this month --->

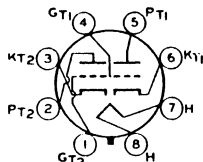
dan

## DUAL TRIODE

# 6EM7

Related types:  
10EM7, 13EM7

Glass octal type containing high-mu triode and high-perveance, low-mu triode in same envelope. Used as combined vertical-deflection amplifier and vertical-deflection oscillator in television receivers employing picture tubes having 110-degree deflection angles and high ultor voltages. Outline 14A, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. For curve of average plate characteristics, Unit No.1, refer to type 6DR7 (Unit No.1).



HEATER VOLTAGE (AC/DC).....	6.3	volts
HEATER CURRENT.....	0.925	ampere
DIRECT INTERELECTRODE CAPACITANCES (Approx.):	<i>Unit No.1</i>	<i>Unit No.2</i>
Grid to Plate.....	4.8	10
Grid to Cathode and Heater.....	2.2	7
Plate to Cathode and Heater.....	0.6	1.8

### CLASS A<sub>1</sub> AMPLIFIER

<b>Characteristics:</b>	<i>Unit No.1</i>	<i>Unit No.2</i>	
Plate Voltage.....	250	150	volts
Grid Voltage.....	-3	-20	volts
Amplification Factor.....	64	5.4	
Plate Resistance (Approx.).....	40000	750	ohms
Transconductance.....	1600	7200	μmhos
Grid Voltage (Approx.):			
For plate current of 10 μa.....	-5.5	-	volts
For plate current of 100 μa.....	-	-45	volts
Plate Current.....	1.4	50	ma
Plate Current, for plate voltage of 60 volts and zero grid voltage.....	-	95	ma
Plate Current, for grid voltage of -28 volts.....	-	10	ma

† The duration of the voltage pulse must not exceed 15 per cent of one vertical-scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical-scanning cycle is 2.5 milliseconds.

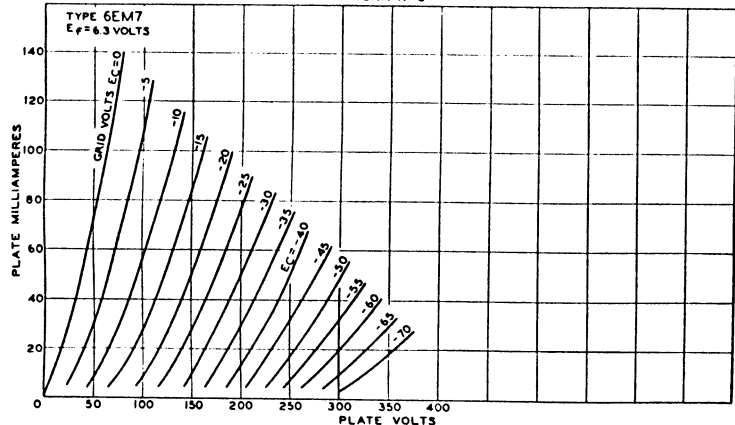
‡ The dc component must not exceed 100 volts.

### VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

*For operation in a 525-line, 30-frame system*

<b>Maximum Ratings, (Design-Maximum Values):</b>	<i>Unit No.1</i>	<i>Unit No.2</i>	
DC PLATE VOLTAGE.....	Oscillator 330 max	Amplifier 330 max	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE†.....	-	1500 max	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE.....	-400 max	-250 max	volts
PEAK CATHODE CURRENT.....	77 max	175 max	ma
AVERAGE CATHODE CURRENT.....	22 max	50 max	ma
PLATE DISSIPATION.....	1.5 max	10 max	watts
<b>PEAK HEATER-CATHODE VOLTAGE:</b>			
Heater negative with respect to cathode.....	200 max	200 max	volts
Heater positive with respect to cathode.....	200 max	200 max	volts

AVERAGE PLATE CHARACTERISTICS  
UNIT NO. 2

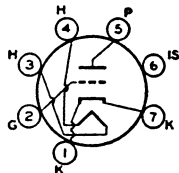


**Maximum Circuit Values:**

<b>Grid-Circuit Resistance:</b>	<i>Unit No.1</i>	<i>Unit No.2</i>	
For grid-resistor-bias operation.....	2.2 max	2.2 max	megohms
For cathode-bias operation.....	2.2 max	2.2 max	megohms

## HIGH-MU TRIODE

Miniature type with frame grid used in vhf tuners of television receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3, 3 amperes, 0.18.



## 6ER5

Related types:  
2ER5, 3ER5

### CLASS A<sub>1</sub> AMPLIFIER

Maximum Ratings, (Design-Center Values):

PLATE VOLTAGE.....	250 max	volts
GRID VOLTAGE, Negative-bias value.....	-50 max	volts
CATHODE CURRENT.....	20 max	ma
PLATE DISSIPATION.....	2.2 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.....	100 max	volts
Heater positive with respect to cathode.....	100 max	volts

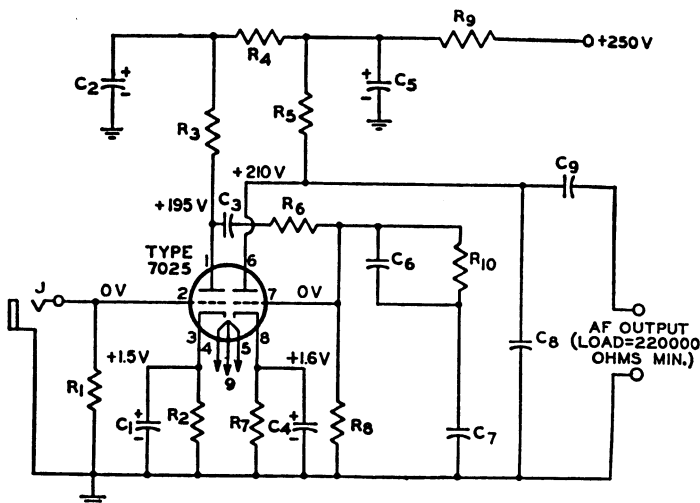
Characteristics:

Plate Voltage.....	200	volts
Grid Voltage.....	-1.2	volts
Amplification Factor.....	80	
Plate Resistance (Approx.).....	8000	ohms
Transconductance.....	10500	$\mu$ mhos
Plate Current.....	10	ma
Grid Voltage (Approx.) for transconductance of 500 $\mu$ mhos.....	-3.8	volts
Grid Voltage (Approx.) for transconductance of 100 $\mu$ mhos.....	-5.6	volts

Maximum Circuit Value:

Grid Circuit Resistance.....	1 max	megohm
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## 29-16 PREAMPLIFIER FOR MAGNETIC PHONO PICKUP With RIAA Equalization



Sensitivity=3 millivolts rms input for output of 0.55 volt at frequency of 1000 Hz.

### Parts List

C<sub>1</sub>, C<sub>4</sub>=25  $\mu$ F, electrolytic,

25 V

C<sub>2</sub>, C<sub>5</sub>=20  $\mu$ F, electrolytic,

450 V

C<sub>3</sub>=0.1  $\mu$ F, paper, 600 V

C<sub>6</sub>=0.0033  $\mu$ F $\pm$ 5 per cent,

paper, 600 V

C<sub>7</sub>=0.01  $\mu$ F $\pm$ 5 per cent,

paper, 600 V

C<sub>8</sub>=180 pF $\pm$ 5 per cent,  
ceramic or mica, 500 V  
(includes capacitance of  
output cable)

C<sub>9</sub>=0.22  $\mu$ F, ceramic, 500 V

J=Input connector, shielded,  
for high-impedance mag-  
netic phono pickup (10 mV  
output, approx.)

R<sub>1</sub>=Value depends on type

of magnetic pickup used.

Follow pickup manufactur-  
er's recommendations

R<sub>2</sub>, R<sub>7</sub>=2700 ohms, 0.5 watt

R<sub>3</sub>, R<sub>5</sub>=0.1 megohm, 0.5 watt

R<sub>4</sub>=39000 ohms, 0.5 watt

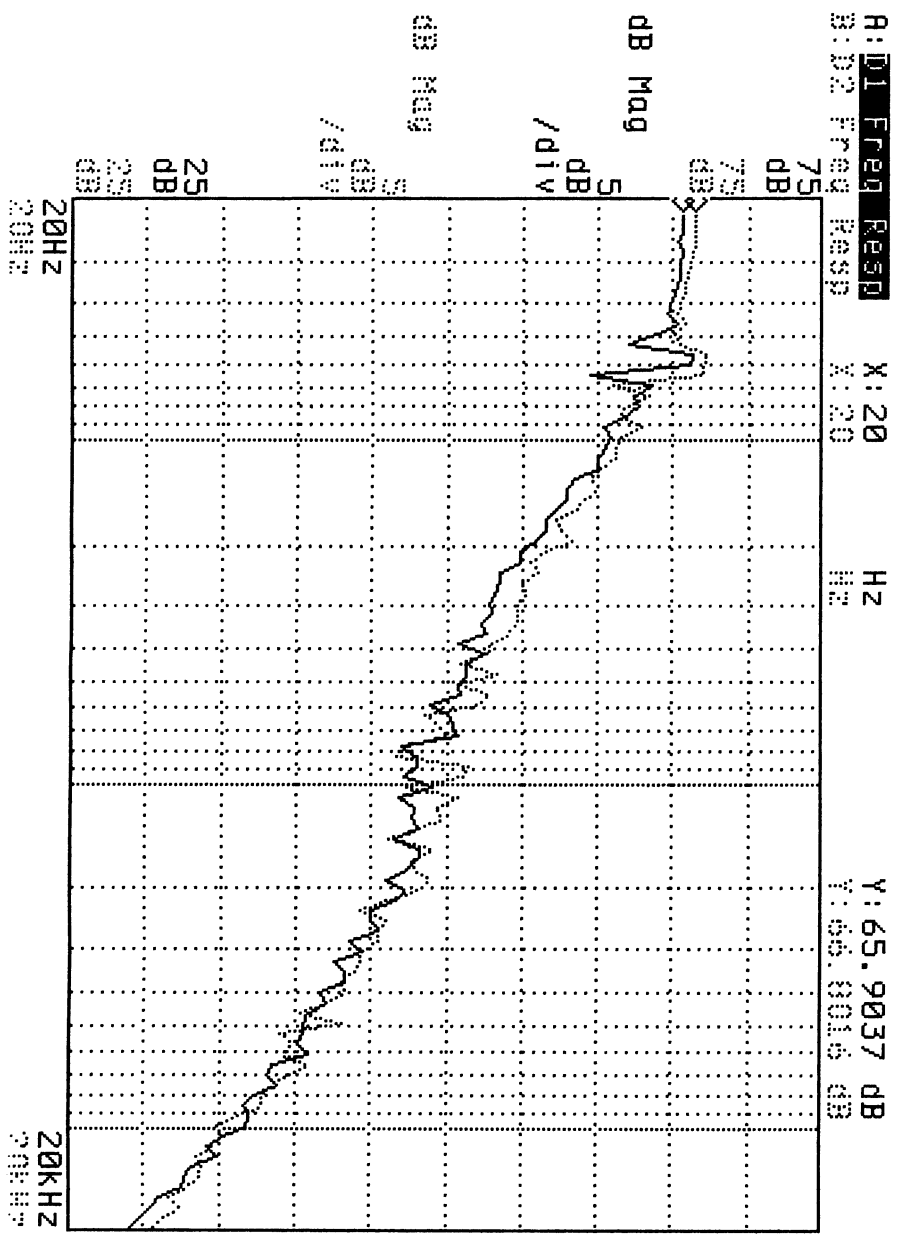
R<sub>6</sub>=0.47 megohm, 0.5 watt

R<sub>8</sub>=0.68 megohm, 0.5 watt

R<sub>9</sub>=15000 ohms, 1 watt

R<sub>10</sub>=22000 ohms, 0.5 watt

THE ORIGINAL RCA PHONO PREAMP (FROM RC-30)



WRIGHT PREAMP RESPONSE CURVE - SOLID LINE  
 PRECISION FIDELITY C7 RESPONSE CURVE - DOTTED LINE



## 304TL - one more time

*Ahal My plan worked. If you want to get the readers to submit some interesting dope for the newsletter, just write a bunch of lies and misinformation to get them incensed.*

*Last month you may remember my stab at calculating SE operating points for the 304TL (I suspect the TL stands for Terribly Large).*

*I used a guesstimating technique developed for calculating operating points for push pull operation, class AB at that, that gave some pretty unbelievable results, and asked for help from youse guys to bail me out.*

*As usual, Resident Smart Guy Paul Joppa came through.*

*Here's his letter:*

Dan-

Last May I wrote about triode operating points. I'm still working on an update (for nonlinear effects that seem to be important), but meanwhile here's a simplified version of the first analysis. I wish I'd thought of it last May, because it's a lot easier to work with! This is it:

plate voltage/plate current =  
5 x plate resistance

load impedance =  
2 to 5 times plate resistance; 3 is typical

Output power will be about 20% of plate dissipation

This assumes plate resistance is measured at the idle current. Often it isn't, but you can adjust it since plate resistance is inversely proportional to the cube root of current. (The factor of 5 is actually the cube root of 108, but close

enough!)

For example, using the 304TL transmitting tube from last month: Plate resistance is not given, but can be calculated from amplification factor divided by transconductance,  $12/0.016700 = 718\Omega$ . But transconductance was given at 1 amp; probably we'll wind up closer to 250 mA so plate resistance is about 718 times the cube root of 4, or  $1140\Omega$ . Then the plate voltage over current should be  $5 \times 1140 = 5700$ . At 300 watts plate dissipation that would be 1300 volts at 230 mA, pretty close to the 250 mA guess. Load resistance of  $3 \times 1140 = 3400\Omega$  is about right. Power output will be about 60 watts.

As in last May's note, this is about the lowest voltage and highest current that can take full advantage of the plate dissipation capability of a given tube. J.C. Morrison said, in *Sound Practices*, "run 'em low and hot"; this method gives a good approach to that condition. You could get more output by using a higher voltage and lower current, but you pay for it with higher impedance (\$!), less tolerance for load impedance variation, and more sensitivity to tube nonlinearities.

-Paul Joppa

*Hmmm... Looks like the output trianrie choice is now limited to the Audio Note 5K $\Omega$ , 75W, 240mA SE transformer (\$350, from Angela Instruments), unless the Hammond 5K $\Omega$ , 100W PP trianrie (modified to air gapped core configuration) from Antique Electronic Supply, \$78.89, can handle the current. The 1900 $\Omega$  Hammond PP trianrie for class AB1 push pull, for around 200+ watts looks tempting too, as I have four 304TLs. Bet that would really wreck my light bill.*

*OK. Now I will take a stab at the 450TH, of which I actually have a pair.*

*Plate resistance =  $38/0.006650 = 5714\Omega$  at 500mA. Actual idle current might be around 100mA, so let's use 5714 times the cube root of 5 for approximate plate*

resistance of  $9770\Omega$ . So plate voltage/current =  $5 \times 9770 = 48850$ . To get close to 450 watts plate dissipation we might use 4500 volts and 92mA. We need a load impedance of  $3 \times 9770 = 29310\Omega$ . Zowie! That's three Audio Note 10K, 150mA, 50W SE triannies in series, with the secondaries paralleled, to handle the 90 watt output. I promise that if I win the Lottery, I will build it.

dan

## more bizarre ideas

Ever studied Electrostatic loudspeaker design? Basically an ESL is a pair of perforated stators, or plates, sandwiched about a diaphragm. The diaphragm is given a negative dc potential, usually around -1500 to -3000V, and the stators are connected to the greatly voltage amplified audio signal (as high as +7,000V peak) in such a way that they voltage swing in push pull. This affects the negatively charged diaphragm, and it moves to the beat, as it were.

Usually this giant voltage which is applied to the stators is obtained by stepping up a power amplifier's voltage output with a step up transformer. An example would be the use of a 8-10Kohm PP output transformer with its secondary wired to the power amp outputs, and its primary wired to the ESL stators.

Attempts have also been made to directly couple the stators to the plates of output tubes which operate at high voltages, like the 813 and 8068 (around 2200V). Unfortunately, 2200V doesn't seem to be quite enough voltage to get much loud out of an ESL. One needs to find a tube that can run at a much higher plate voltage, like around 7kV.

Although the ESL doesn't pass current like a conventional, coil type driver, current output of the amplifier does enter into the issue. The current requirement is determined by the capacitance of the ESL panels, the peak voltage applied to

the stators, and the highest frequency at which the amplifier must be able to operate without current clipping. This last factor corresponds to the power bandwidth, which is not the same as frequency response. Most speakers require less power above around 1500 Hz, so a power bandwidth of 2-3kHz is probably adequate.

These factors relate as such:

$$I = 2\pi fCE,$$

where I = current

f = frequency (in our case, upper power bandwidth -3dB frequency)

C = capacitance of one side of ESL panel

E = Voltage on stator

OK, let's try an example. Say we build a panel 2'x3', with 1/16" stator to diaphragm spacing. This gives us a C of about 3000pf.

Now our 450TH can take about 6000V at 75mA, so let's solve for f, our power bandwidth:

$$\begin{aligned} f &= I / (2\pi CE) \\ &= .075 / (6.283)(3 \times 10^{-9})(6000) \\ &= 663 \text{ Hz} \end{aligned}$$

Whoops, not high enough. We can either reduce the capacitance of the panel by increasing the spacing, which means lower output level, or making it smaller, which reduces output and also loses bass. We could add tubes in parallel to increase our current output, but I don't have a huge supply of 450TH's, so I'll try a different tube instead.

How about the 6BK4 (see the data)? It can take up to 16 kV before turning into an x-ray machine, but only handles 1.6 mA!

OK, using a power bandwidth of 2kHz, an E of 7kV, and I of 1.6mA, let's solve for C:

$$\begin{aligned} C &= I / 2\pi fE \\ &= .0016 / (6.28)(2000)(7000) \\ &= 18 \text{ pF!} \end{aligned}$$

That works out to a 1/16" spaced panel of about 2.25"x2.25". We would need

172 of these to make our 2'x3' panel! Yes, that means you need 344 tubes per channel for push pull. Cool.

But wait, this could be the way to a killer tweeter. Let's build a panel equivalent to an array of 2x4 of our tiny panels, 4.5"x9". That might give us a low frequency cutoff due to diffraction loss in the 2 kHz range with about 100+ dBm peak output above that point.

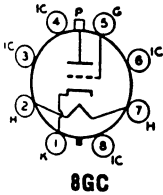
The filament current required for the 16 tubes in push pull needed to drive the panel is a measly 3.2 amps at 6.3V (0.2 amp per tube), and the plate current requirement is 25.6 mA at 7kV. A voltage multiplier could produce this from a surplus ham transmitter tranny, for example, quadrupling a 1750V at 100 mA transformer.

6BK4's list for a hefty \$16.50 in the AES catalog. Why, is there a secret society of 60's color TV restorers willing to pay big bucks for obscure TV tubes? It seems like there's always a bunch of 6BK4's and the like in the way when you're dig-

ging in a box of tubes for 2A3's at a swap, so a person should be able to dredge up a bunch for cheap.

If you don't find a few dozen, how about building stereo ESL headphones from single 2.25"x2.25" panels and four 6BK4's? At 7kV, they should play loud and low, and you could probably scab a power supply from an old TV or scope. Just space them away from your ears and insulate them well. If you zap yourself on any of this stuff, you do so at your own risk. I do not say any of these ideas is absolutely safe, although even 26 mils of 7kV shouldn't kill you. Remember that the old Tektronix scopes had warnings printed in them that the 300-400 volt supplies in their scopes were far more dangerous than the 8000 volt one. So treat a project like this with the same respect you should be giving your other tube amps.

See Audio Amateur:3,4/72;4/75;1/76; 2,3/77 - Speaker Builder: 2,3,4/80; 1,2,3/90 - Wireless World:7,11/76;11/79.



## 6BK4C/6EL4A

### BEAM TRIODE

Heater Voltage (ac/dc)	6.3	volts
Heater Current	0.2	ampere
Peak Heater-Cathode Voltage	-450* max	volts
Direct Interelectrode Capacitances (Approx.):‡		
Grid to Plate	0.03	pF
Grid to Cathode and Heater	2.6	pF
Plate to Cathode and Heater	1	pF

### Shunt Voltage-Regulator Service

<b>MAXIMUM RATINGS (Design-Maximum Values)</b>		
DC Plate Voltage	27000	volts
Unregulated DC Supply Voltage	60000	volts
DC Grid Voltage	-135	volts
Peak Grid Voltage*	-440	mA
Average Plate Current	1.6	mA
Plate Dissipation	40	watts

#### TYPICAL OPERATION

Unregulated DC Supply Voltage	36000	volts
Equivalent Resistance of Unregulated Supply	11	megohms
Voltage Divider Values:		
R <sub>1</sub> (5 watts)	220	megohms
R <sub>2</sub> (2 watts)	1	megohm
R <sub>3</sub> (0.5 watt)	0.82	megohm
DC Reference Voltage Supply	200	volts
Equivalent Resistance of Reference Voltage	1000	ohms
Effective Grid-Plate Transconductance	200	μmhos
DC Plate Current for Load Current of 0 mA	1000	μA
DC Plate Current for Load Current of 1 mA	45	μA
Regulated DC Output Voltage for Load Current of 0 mA	25000	volts
Regulated DC Output Voltage for Load Current of 1 mA	24500	volts

#### MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance	3	megohms
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\* For interval of 20 seconds maximum duration during equipment warm-up period.

## **dream systems**

I asked Dave and Doug to give me their ideas of a dream vintage system, just in case we have a wealthy, grateful benefactor who wants to give us all Christmas (and Hanukkah) presents for doing such a good job. First the vintage systems:

*Doug -*

" This is difficult because there are so many I want. My first thoughts were:

turntable: Thorens TD 125 with SME arm

and Grado TLZ cartridge

tuner: Fisher FM 1000

preamp: McIntosh C-20

power amps: Craftsman C500 (with KT-66 output tubes)

Speakers: QUAD ESL

After some thought about aesthetics I came up with this mix:

turntable: Thorens TD125 with SME arm and Grado cartridge

tuner: Marantz 10 B

preamp: Marantz 7

power amp: Marantz 8B

Speakers: QUAD ESL"

*Dan-*

speaks - Stacked QUAD ESL's

amps - Brook 12A's (RCA 2A3's, please)

preamp - this was tough, a Marantz 7 might be right, or a Mac C20, or a Fisher 400C, or a Citation 1, or a Scott LC-21, or an Eico ST-84 but I don't know... how about a Heathkit SP2? The old caps hold all these preamps way back from present day stuff.

tuner - Marantz 10B - everybody says it's the best. I have yet to hear one. Fisher FM1000 would be the second choice.

turntable - TD124, natch, w/SME arm, and I guess a Shure V15, although I'm really a moving coil kinda guy.

*Dave-*

Dave threw me a curve. He wants a vintage *radio station!*

-a 1 kilowatt RCA transmitter

-an RCA limiter

-a Collins 212G console

-2 RCA 77DX mics

-Ampex 351 tape decks

-a pair of Presto 64A transcription turntables with a 16" SME arms

oh yeah, and a license!

For homebrew dream stuff Doug offers this:

"There are so many choices. My thoughts:

turntable: AR-Xa with modified stock arm and Grado cartridge

tuner: restored Fisher FM-200B

preamp: Audio Research SP-6a (not quite "vintage")

power amps: Dynaco Mark III fully converted to triode (push-pull)

speakers: Lowther PM-7A drivers in home-made "Acousta" type folded horn cabinets, sized larger to improve low frequency response."

Dave too wants to play with Lowthers, but he wants to build a push-pull amp using 6AQ5's.

As for me? Well, I like my Whamos and-Triophonis, but for the sake of argument I'll dream up a gonzo homebrew system:

turntable: belt driven, with a glass platter, with a magnetic levitation bearing. The drive motor and pulley? A direct drive turntable. Tonearm would be the "bizzarrm" (father of the Well Tempered arm, originally revealed in Wireless World) with monofilament suspension and a viscous damping system. How about a homebrew strain gauge cartridge and built in nivistor preamp?

preamp: passive with stepped attenuators

tuner: George Wright's working on a killer tube tuner. I want a copy.

speaks: 3'x8' ESL's running at 6000V

amps:direct coupled PPP 450TH's for each 2'x3' section of the ESL's (7200 watts dissipation per channel!) see p10.