VALVE

VINTAGE AUDIO LISTENERS AND VALVE ENTHUSIASTS

in this issue -

6B4s + Magnequest = SEcstasy

Triode Operating Points

Rick's W-5 mods

Dynaco Restos

pictures, graphs, schematics!

upcoming meetings

May 7,1995
W-5's and Modded A7's
at Rick Graves'
10 a.m.

May 27,1995
Tube Audio Clinic
At Nuts About HiFi, Silverdale
6-9 p.m.

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1995

VALVE

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dedicated to the preservation and dissemination of vintage audio knowledge.

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editor's thing

Whoa baby, this is the best issue yet!

We've got a little something for everybody this month.

You guys and gals wanted the 6B4 SE amp schematic - you got it

You wanted Rick's W-5 mods - you got it

You wanted more graphics - you got it

We also have the recipe for reliable and super shiny Dynacos by Doug, and an article on triode operating points by Paul that has me envious of his understanding of this subject.

I also tried to include some nicer photography and CAD work this issue. I used a local lab for the print work and found out that B&W now costs more than color to process! Any B&W photo types out there willing to do photos and prints for the letter?

I need to say at this point that we are getting much more input from the constructors than the collectors. This seems odd because the collectors should have a much easier time of producing an article or two. Just a brief description, a couple nice photos, and a schematic, if you have it, make an article. C'mon!

Rick has invited everyone to bring stuff to swap before the meeting at his house. He has a big yard, so bring some neat stuff, a table if you have one, and a pocket full of money. Bring your favorite software too.

We have also been invited by Bill Benson of Nuts About HiFi, in Silverdale, to hold a swap meet in his parking lot some Sunday. How about July?

Speaking of money matters, I got a baby coming in July and I'm looking for some part time work to feed her. Would appreciate any leads!

I'm looking for some ideas for future meetings. Give me a call if you have a request. And keep the surprises coming to the meetings. They are really fun.

Don't let the blue smoke out,

DAN

letters from Fred (and Mike)

I talked to both Fred and Mike last month about the number of requests received for info on the great 6B4G SE amp designed by Fred and commisioned by Mike. Here's what they had to say:

14 Sept. 94

Dear Mike, With reference our conversation last evening, I am forwarding the following:

Schematic of the amplifier now in use (see next page):

The filaments for the 6SL7 and the output tube are separate, but both DC with 470 mfd. final filter.

The plate voltage also has about 470 mfd. output capacitor, shunted by 0.22 mfd. The shunt capacitors are to overcome some of the inductance that exists in electrolytic caps.

Also shunted the arm of the bias pot to ground with another pair of capacitors.

The driver stage by itself shows flat response from below 20 cycles to starting to droop above 40 KC, the droop probably due to the stray capacitance and cathode to filament capacitance shunting the 100K grid load.

The Magnequest transformers are excellent. As far as extending the high frequency end, most peoples hearing drops off above 7000 cycles, so why go to 20 KC?

With the Jim Lansing 12 and 15 inch speakers, with the high frequency horns, one has an excellent and most efficient speaker system.

Hope this will be of interest.

Fred

4-18-95

Dan,

Sorry this is so long in coming. I picked up the stereo version of my mon-blocks on Friday. Jerry looked at the Morrison Micro schematic (Sound Practices, Summer 1993) and decided he liked Fred's design better. I did persuade Jerry to incorporate a rectifier tube in the stereo version.

However in listening I don't seem to prefer one over the other (solid state on monos to tube on stereo), they are quite similar in sound, I love them both!

I ventured into the analog scene last week - it sure has its ups and downs.I borrowed a cartridge from Bill Short whom I purchased the turntable from. I was to use it while waiting for my cartridge to arrive. I decided on a Sumiko Blue Point special, as the turntable has a Sumiko tone arm - anyway, I was listening to a record and noted that sound was only coming from one speaker.

Under investigation I found the needle on the cartridge was bent - I'm not sure how, but I got on the phone to Bill to let him know (Bummer!).

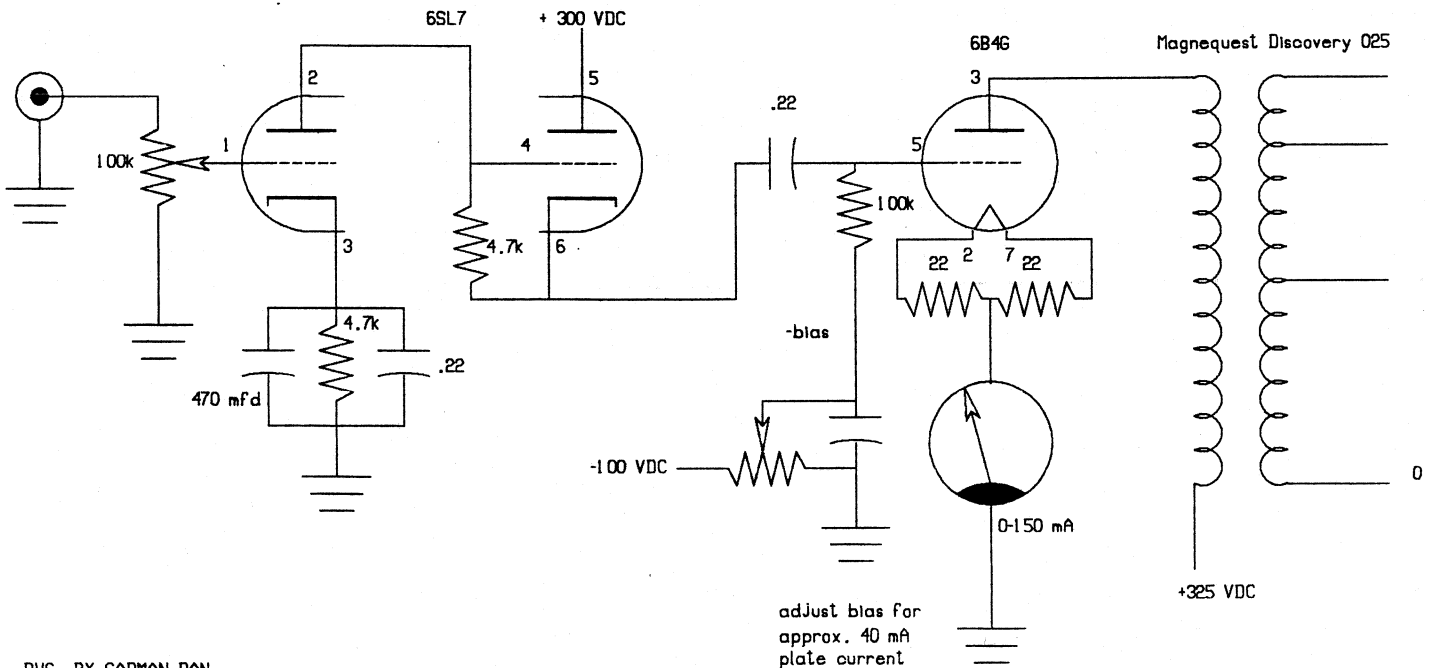
A couple of days later my Blue Point arrived. To make a long story short, after playing about four albums I broke the needle off the cartridge while cleaning the turntable - I about passed out! Anyway, compact disc is sounding better all the time.

Sincerely,

Mike Hayes

If it makes you feel any better, Mike, I've been trashing styli since I was 15. Of course back then it was cheapo Empires. This past couple years I clipped the stylus off a Sonus Blue (no replacement available) and brushed the diamond right out of a Grado MC+ ($135 mistake). I'm scared to use my Audioquest anymore. Rebuild is $350, $125 more than I paid for the cartridgein '84!

SINGLE ENDED 6B4G AMPLIFIER



DWG. BY CADMAN DAN

3 April, 95

Dear Dan,

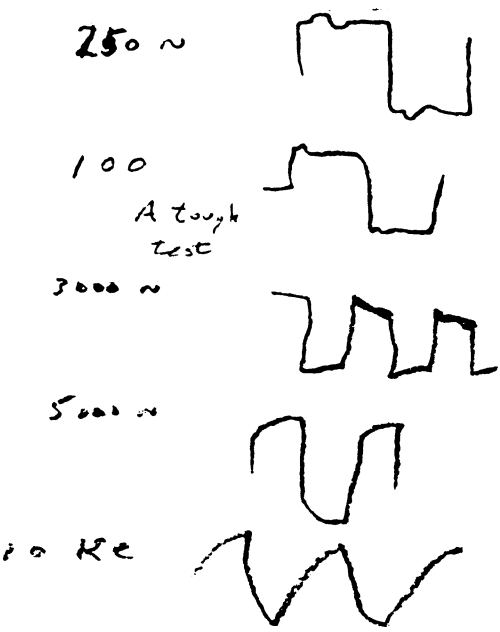
Just want to get the credits where they belong, the 6SL7 circuit that I use is not my design, it is a modification of one we used for driving the sweep circuits on radar indicators during and following WW II. With steps, markers, pedestals, etc. to help identify targets on scope screens many various circuits were developed to pass the resultant sharp edge patterns.

In my SE amp with Mike LeFevre's outputs I started with the Tek scope across the 330,000 grid (of the 6B4G) resistor and fed in a square wave signal from the G-R sig.gen. Varied the 330K resistor with a pot and looked at the low frequency waveform. Ended up with about 470 ohms as grid resistor! That kept the low frequency wave square, and the input capacitance of the 6B4G does nothing to the higher frequency end.

There are other ways to drive the outputs with good waveform. The square wave is a good test, and the other day I put the scope across the voice coil of the Jim Lansing, no 'T' pad isolation, and got good waveform thru Mike's transformers. He does an outstanding job.

In that my little amplifier is built on old chassis with holes and add-ons, and changes, it is not very pretty, so am planning now on building another with Mike's larger SE outputs.

These are poor sketches of the square wave output:



Next time I will use one of the cameras and take photos of the actual waveform.

My sketching is like my soldering! Hold the iron over the connection and drop solder on it!

Fred

lightning strikes twice - western electric rides again

By now you must have heard that Western Electric is back in business with the soon to be released 300B. Before you heave a big sigh of relief, note that the suggested retail price will be $350. You can get an OEM break if you order 250 pieces a year.

They should be available by mid July. They will be identical to the originals, right down to some of the original staff being involved. If everybody runs out and spends $700 to retube their $600 AES SE amps, WE will re-release the 350B, 274B, 310B, 262B, etc.

I'm sure some collectors are going to come out and proclaim them not as good as the originals. Shoot, if you're going to piss away that much money, a Vaic VV30 is supposed to be better anyway. After all, why buy 60 year old technology when you could get new. Besides, $700 would buy a lot of CD's, and they don't wear out.

world audio amp- two months later

Got my little integrated 6080 amp back from a loan out this month. I was anxious to try it with my new speaks, as the 10Y SE was a little too puny, and the Triophoni amps were a little too big. The 6080 was just right. Read the article in GA about the 812A amp and decided to try 6BQ7's in place of the Sylvania 6922's I had been using. Gain was higher, and the highs seem more apparent. Yanked out the T'funken 12AX7 and put in a 5751, as I had heard some people like it better than a 12AX7, and I think it brightened things up a bit more. I did not optimize currents or anything else.

The bass is very nice, if still a bit light (from the speakers, not the amp). I think the feedback in the 6080 amp really sound better than the zero feedback 10Y. I heard a Cary 805 running Wilson X-1's the other day. With the feedback control at zero, bass was lousy. Turning the control up a bit (maybe 6dB?) really tightened it up. It would seem that SE amps playing the full range need a little feedback to control those cones.

what's brewin'?

Roger is taking the Welborne Stereo 70 (see photo,) to the world of triodes. 6CK4's will replace the EL34's, with some rebiasing and pin swapping.

The big 211 SE amp is taking shape in my mind's eye. Imagine one chassis with big half wave rectifiers all in a row, and another above it with the amp tubes. All behind glass and backed with polished brass in a birdseye maple and zebrawood cabinet. Wanna commision one for say, $10,000?

Found data on the Eimac 304TL's and 450TH's sitting in the shop, thanks to Mike W. The 304TL's should make great SE amps.

Kai is getting parts together to build an Onken/Edgarhorn system. Think I have him talked into using triodes for amps.

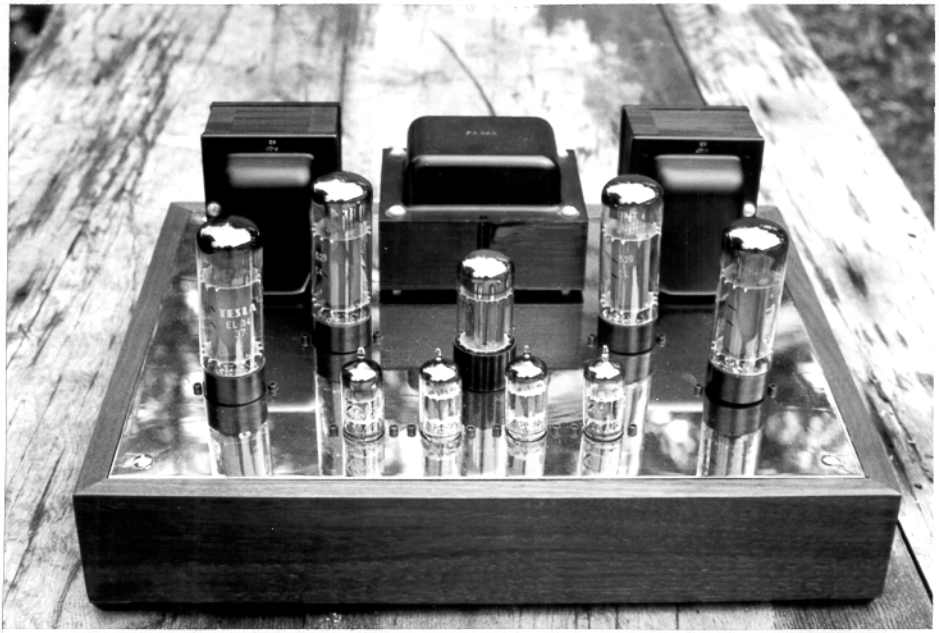
Both Ways update

A few observations by various listeners have me designing up a few variations to the original design.

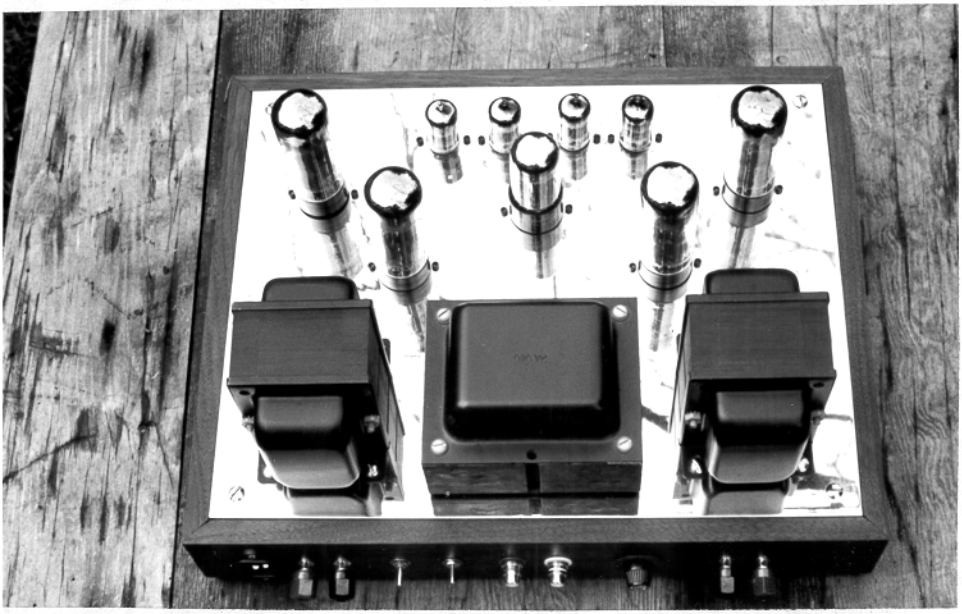
One was that I haven't completely removed the 'megaphone effect', like a PA column makes, from certain female vocalist's voices. Placing the drivers on a concave curved baffle may improve the vertical dispersion at close range and reduce this problem at the same time.

Also, bass response falls off from 80 Hz down faster than theory predicts (about 6 db down by 50 Hz). I'm also getting some buzzing from the ultralightweight cabinet material, as it couples extremely well to the air pushed by the internally mounted woofer. A great deal of low frequency energy is coming out of the sides of the cabinet, which sounds fine, but MDF or resin/concrete walls may get more low bass energy out of the box to the listener.

A final observation by yours truly is a very narrow suckout at 4kHz. This doesn't seem to be noticable except during a sweep. Something to do with the dust cap, I think.



Roger Premoe's walnut and brass chassis Stereo 70



amp is based on the Welborne Labs modification

dinkin'around

tech tips and other unsolicited advice

- this month Doug Grove gives us some tips on how he performs his miraculous restorations of Dynaco amps.

The restoration of tube power amps such as the Dynaco Mark III and Stereo 70 can result in great sounds and good looks for a moderate investment of time and money. Recently I was rewarded for my efforts when a client of mine (an experienced audio recordist) exclaimed "Wow, these amplifiers have unbelieveable detail - I can hear the bow rosin on the string before the note starts!" This was from a pair of carefully restored Dynaco Mark III's rescued from his friend's attic, running on Genelex Golden Monarch KT-88's.

These results require an almost fanatic commitment to detail, and a certain understanding of electron flow. You don't have to be an engineer, but a good working knowledge of electronics, mechanics and finish carpentry is very helpful.

Number one, be sure to obtain a circuit diagram (which the VALVE library can provide for copying costs). A complete restoration will require total project teardown, removal of all wire, and desoldering every component. If you're really worried about getting it back together right, a few photos and sketches will help.

A digital multimeter is also a necessity. Once you have disassembled the unit test every electrical and hardware component to make sure it works and meets specs. If it does not, replace it. It's generally good practice to renew the main filter capacitor and other electrolytics, and coupling/bypass capacitors. Desoldering things like tube sockets is a pain, but the reward making those new connections will be better signal path and the resulting inproved sound quality.

Dynaco products use a circuit board assembly for the driver amp components. Remove all wire, coupling/bypass caps and clean the board with non-flammable solvent and a toothbrush. Unless there is physical damage, this cleaning will go a long way towards correcting high frequency drop out and distortion commonly attributed to the board.

Only when you've torn it all apart, will you be able to work on the nickel/chrome chassis. Be careful of the lettering! Finish your work off with auto paste polish to ward off fingerprints and corrosion. Transformer cans look real sharp when repainted, but have to be disassembled for best results.

Reassemble and rewire with care, using high quality wire. Soldering is an art. It is also the key to good electrical conduction and the resulting quality sound reproduction.

I consistently incorporate a few modifications to improve amplifier performance, the first being additional B+ filtration. About 200 mfd will provide some added reserve power to improve low end punch without high-end frequency loss. Do not compromise on the voltage rating - 500WVDC is a minimum. Highs are greatly improved by the replacement of coupling and bypass caps. Another improvement is the replacement of selenium rectifiers(in power supply and /or bias circuits) with high quality diodes. This results in less voltage drift and cleaner power.

A component used commonly in solid state rectified power supplies can preserve your tube amp in two ways: Soft-starting and voltage regulation. Use a thermistor to limit the inrush voltage on the primary side of your power transformer, resulting in a slower voltage rise at the filaments and B+ current. When warm, the right thermistor value will trim secondary voltage by about 5%, saving tubes and components from today's higher line voltage, with little sacrifice

in amplifier power output. Choosing (and finding) the right thermistor requires patience. Use negative temperature coefficient (NTC) types which decrease in resistance as current heats them. They're not too expensive, so experiment with a few values for best results.

And finally, the tubes. A tube tester is really helpful. For tube testing equipment cruise the garage sales or swap meets and pick yourself up a "dynamic mutual conductance" type if possible (we have testers for damn near everything here at the shop - dan). Tube testing can only identify major defects and estimate tube performance. Nothing can substitute actual testing in the circuit. I do preliminary matching using the tester, then road test, switching them around as required for equal bias, current draw, etc.

It takes dedication, patience and hard work to restore a vintage amp. One Mark III is easily worth 16 hours. But it's well worth it. When you're done with yours, bring it to the next meeting to show it off!

letters

solar powered tubes

Hi Dan,

Recently received the latest newsletter from you - excellent as usual *(thanks - dan).* Glad to see humor in your publication. Hey, this stuff is great fun - from conception, to gathering parts, to putting them together, to listening. All of this and it glows in the dark! Heck, even the failures are exciting, what with sparks and firecracker-like explosions. Every time I use a certain screwdriver I gaze fondly at the melted notch in it and think of how it got there.

Good luck with your new business and especially with a speaker we triode nuts can use. I scratch built a preamp and gained a healthy respect for that aspect of building equipment (the mechanical part).

My power at home comes from solar panels. The system has finally grown to a point where I've thoughts of unboxing my equipment. My latest aquisition is a set of 12 volt, 800AH sealed batteries - six two volt cells. At last, DC for the filaments without using solid state devices. Obtaining the AC is another matter. Using a solid state sine wave inverter doesn't seem - well - quite right to power our beloved bottles. I am on the lookout for a rotary inverter. I've found a 24Volt one but not a 12 Volt one yet. I lost my *Cosmic Electronic Parts* catalog that had a DC transformer in it.

Keep up the good work and keep having fun,

Mark Heinlein
Bend. OR

PS Oops - forgot one of the reasons I wrote. I am very interested in your past issues and think maybe selling a year's set at a time might be the way to go. Don't know if I can be much help at this distance -

Hey, what's so funny about this newsletter? Actually I'm trying to get more serious about Hi-Fi these days. I heard that banks will pay interest on CD's, but you have to keep your own records for tax purposes, so I took my CD's to the bank, and took all my LP's to the IRS this year.

I thought Eric said they did a lot of auditions this time of year. Turned out he said audits. I still don't get why they say "Please bring all your records." I've got about ten boxes full, and if they're not going to play them, I don't want to haul them in. As for pyrotechnics, I gotta say one of my favorites is the inverted geyser effect you get when the juice boils out of a bad filter cap. Had a Heathkit amp that whistled like a teakettle when it blew. Pretty cool.

Triode amplifier operating points

By Paul Joppa

How do you choose a good operating point (supply voltage, current, and load impedance) for a vacuum tube? For ordinary tubes, used in an ordinary way, it's simple - you just look it up in your RCA handbook. But suppose you want to use an unusual tube (e.g. the 6CK4 television vertical amplifier)? Or suppose you just want to try breaking the rules?

I struggled with this problem recently, and I've concluded that there really is a single "reference" operating point for any given (triode) tube, and that variations around that point have similar effects for all triodes. I've only studied single-ended class A triode circuits with zero grid current (actually class A_1), but that covers a lot of audio circuits of interest. Mostly, I've looked for conditions that provide the maximum power output. Even for preamps, I think that's a good tradeoff operating condition. Yes, you can get a few more volts out of a tube, but only at the price of a much higher output impedance. Most of the numerical results are based on a "perfect" triode, following the 3/2 power law.

Figure 1 shows a typical power triode load line, drawn on the plate curves - in this case, a 2A3 operating at the handbook recommended conditions of 250 volts, 60 mA, and 2500 ohms. Here's what happens if you vary these conditions:

If you raise the impedance, the load line becomes more horizontal, so the output voltage increases while the current decreases. The power will go down, though slowly at first, and the distortion will also go down. The distortion reduction is caused by the load line end point moving up out of the non-linear region (low current region). If you reduce the load impedance, the available input voltage swing will be limited by cutoff so the power will go down again, this time with increasing distortion. Figure 2 shows a typical result. Notice especially the relatively wide range of load impedances over which substantial power is available - a good thing, considering how much speaker impedance can vary with frequency! Power tubes are usually run at about twice the maximum-power impedance to reduce distortion without losing too much power.

If you increase the supply voltage, you will have to decrease the current to keep within the plate dissipation limit. The load impedance for maximum power will then increase rapidly, and also the range of impedances for full power will get narrower. If the tube remains linear at high voltages and low currents, the distortion in this case will be less and the efficiency and power output will increase. Sounds like a winner, right? Unfortunately, two things limit how far you can go with this. You can't safely exceed the maximum rated plate voltage. And most tubes are NOT linear at high voltages and low currents; the plate curves start to bunch up and flatten out, causing more distortion. (Incidentally, this distortion is mostly second-harmonic, which is cancelled in push-pull operation. This is why P-P amps are often run at higher voltages than SE, and why they often have higher efficiency. Eventually this will lead to class AB and class B operation.)

If you reduce the supply voltage, you must also lower the current to keep the operating point away from the start of grid current. The power output drops quickly, although the efficiency remains the same. The load impedance will increase, but not by a lot. This often happens with voltage amplifiers, where a low supply voltage requires less current - and higher circuit impedances - than the tube is otherwise capable of.

Figure 3 shows how load impedance, current and power output vary with sup-

ply voltage, relative to the reference operating point. I have shown a range of impedances, from maximum power to 1% distortion (for perfect triodes, of course).

So, how do you find the reference operating point? I have defined it as the minimum supply voltage at which the maximum power operating point uses the maximum plate dissipation. Based on my computer models of a perfect triode following a 3/2 power law, this is how it works out:

If you know rp (plate resistance) at current I, and choose a dissipation power P, then

$$\text{voltage } E_{ref} = [\, 108\, I\, rp^{3} P^{2}]^{0.2}$$

Then

$$\text{current } I_{ref} = P/E_{ref}$$

$$\text{load } R_{ref} = 0.37\, E_{ref}/I_{ref}$$

At this operating point, the maximum power output P_{ref} is about 23% of the plate power P.

As you can see, the 2A3 handbook conditions are about right. You can also see why the 211 really wants to see 1200 volts! Notice the high plate voltage on typical voltage amplifier triodes. Remember, this is the plate voltage - for RC coupled amplifiers, the plate resistor will drop nearly as much voltage as the tube, so the supply voltage must be nearly twice this much. Few of us want to run our 12AX7's on 1000 volts! You can either find a low-voltage tube like the 6DJ8/6922, or operate at lower power (a 12AX7 at 200 volts and 0.5 mA, for example), or give up some maximum output capability by running a smaller plate resistor.

I hope you have as much fun with these formulas and curves as I have!

Here are some examples for popular tube types (the typical load impedance is twice the reference value):

Type	plate power	plate volts	plate current mA	minimum load impedance ohms	typical load impedance
2A3	15 w	237	63	1400	2800
211	75 w.	1100	67	6100	12,200
6CK4	12 w.	255	47	2000	4000
6SN7-GT	2.5 w.	310	8	14 k	28 k
12AX7	1.2 w.	540	2.2	91 k	182 k
6DJ8/6922	1.5 w.	150	10	5.3 k	10.6 k

Been getting requests for back issues lately. The general concensus is a preference towards offering a full year's issues as a package. We will offer the 1994 set for $20.00.

I will have the first few issues reduced to the current format size for ease of storage. I would appreciate a note or call if you are interested, in order to figure how many to reprint.

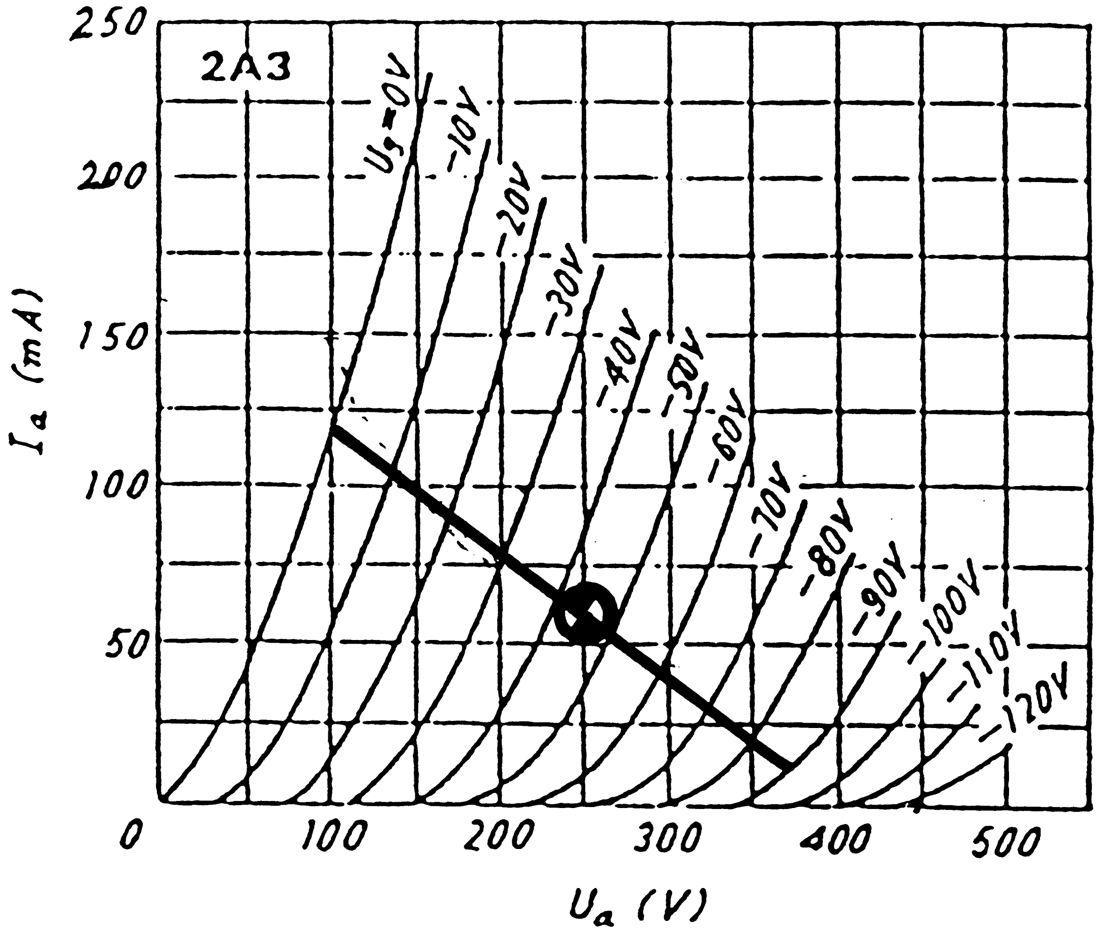

2A3
Ug=0V
-10V
-20V
-30V
-40V
-50V
-60V
-70V
-80V
-90V
-100V
-110V
-120V
250
200
150
100
50
0
100
200
300
400
500
Ia (mA)
Ua (V)

FIGURE 1

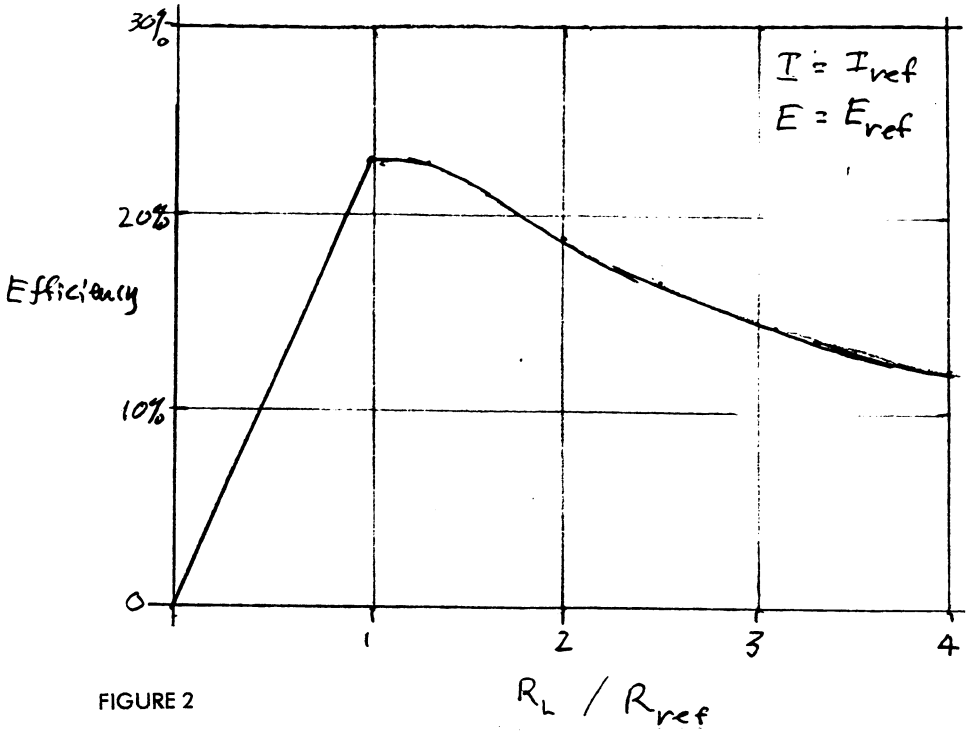


FIGURE 2

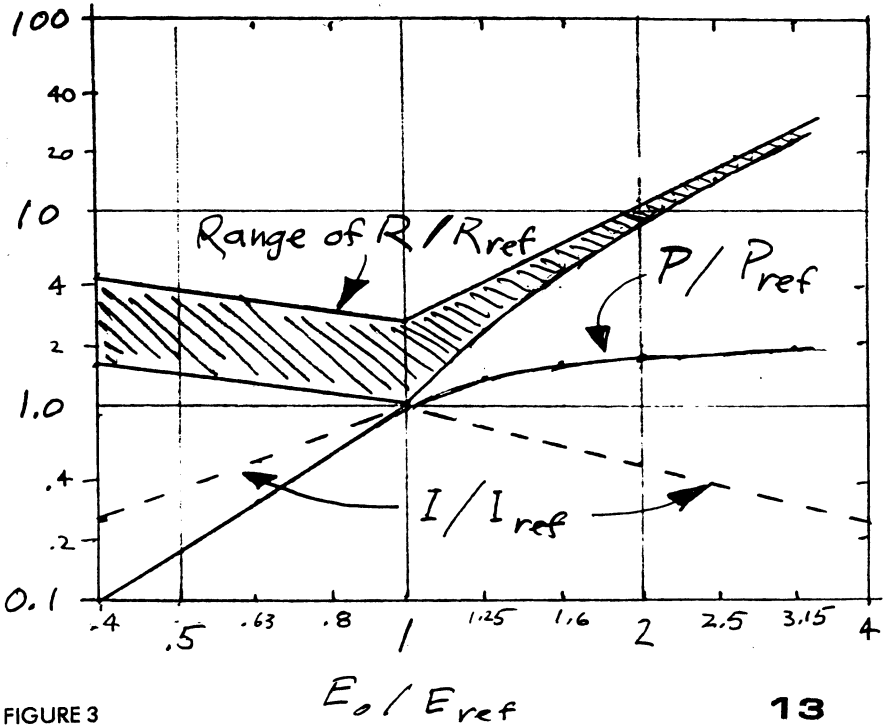


FIGURE 3

Heath W-5 mods

By Rick Graves

Dan says that some VALVE members and subscribers have asked for information on mods for Heath W-5 amps. So Dan asked me to describe the mods I had completed on two pairs.

Why modify the W-5? I have heard that the W-5 makes a great-sounding amp when the parts are upgraded. They are not that rare, so I do not feel guilty modifying them. Modifications of vintage gear generally reduce market value, but the W-5's market value is not that high to begin with.

This project began for me only as a parts upgrade -- I intended not to modify the W-5 amps at all. The potted Peerless output transformer and KT-66 output tubes are connected ultralinear. The front end is all class A triode in a Williamson configuration (Figure 1). In the front end, there are two twin triodes, 12AU7s. The first section if the first tube is the voltage amp, followed by the phase inverter, the other section of the first tube. The two sections of the second tube function as the drivers for the power tubes, one triode for each KT-66. I have seen a mod that replaces the front end with a "Mullard" circuit using a pentode EF-86, but I prefer to keep the front end all triode. Thus, I planned to rebuild with metal film resistors, "audiophile quality" film coupling caps, new electrolytics in the power supply, film bypass caps for the output tube grid electrolytics, and gold-plated input and output, while keeping the circuit stock.

However, as I was stripping each amp down to the bare chassis and completely rebuilding each one, it seemed that a couple of changes would be advantageous:

1) Make the amp compatible with both tube and solid state rectifiers, such as the HEXFRED. I had heard some solid state rectifiers sounded better than others, so I wanted to compare. (See VALVE newsletter for the rectifier shootout results, January 1995, p. 6.) Solid state rectifiers increase the B+ voltage because there is less voltage drop across them, compared with a vacuum tube rectifier. It is best not to overvoltage the twistlock capacitors -- more on this mod later.

2) Add some high voltage, small value caps at the rectifier to minimize whatever noise might be generated by solid state rectifiers, if used. This could also help clean up noisy power ("mains" to the British).

3) Add an "inrush current limiter" to the amp in front of the power transformer. This device will help soften the sudden rise of B+ if you use a solid state rectifier.

4) Convert the amps to use 807 power tubes, rather than the KT-66 or 6L6GC. The 807 is equivalent to the other two, from a plate impedance standpoint. They are also a lot cheaper.

5) Improve the transient response of the power supply by bypassing the electrolytics with polypropylene film caps at the points where the circuit draws voltage from the power supply.

6) Lastly, I had an extra 20 µF section left over in the new twist locks I was installing. I decided to add an extra pi filter immediately before the pi filter that feeds the driver stage. So I added the extra resistance needed to protect the twist locks primarily before this section (see item 1, above, and the section below).

HEXFRED compatible

Following the rectifier, the W-5 has three stages of capacitance filtering comprised of electrolytics stacked in series, along with dropping resistors (see the schematic, Figure 1). Those three stages can handle the extra voltage from a solid state rectifier no problem. However, you should not subject the pi filters further down to voltages in excess of 500 volts, the maximum available these days. I found it was necessary to

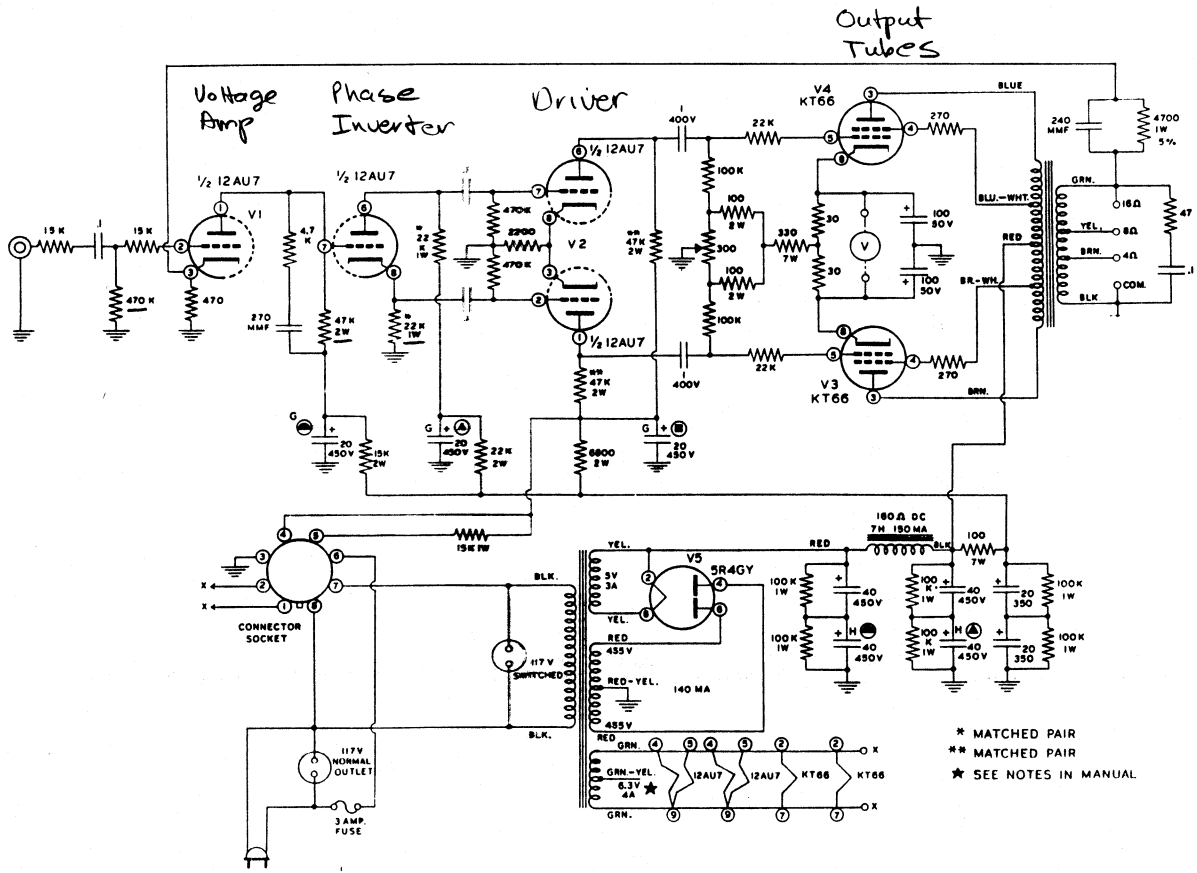


FIGURE 1

THE HEATHKIT W-5M HIGH FIDELITY AMPLIFIER

increase the resistance between the last pair of stacked caps and the next section of filtering. This makes sure the first non-stacked pi filter always sees less than 500 volts. This would reduce the voltages if you use a vacuum tube rectifier, but that is probably OK. Heath designed the amp to power a preamp, which would also pull down the voltages for the front end. Since I do not use the amp to power a preamp, I figured a reduction in the front end voltages would still be within the design range.

Figure 2 and Figure 3 show the stock and modified power supplies for the W-5. In Figure 3, I only give parts values that differ from the original circuit. Note that for simplicity I have omitted the dropping resistors that parallel the capacitors stacked in series. (The original schematic shows the resistors.) Bear in mind that these dropping resistors are important and you should not omit them if you undertake any mods.

To implement this change, I changed from a three to a four tab terminal strip at "P", and wired a 3.2K Ω 10W resistor from pin 2 of terminal strip Q to the new, extra pin 1 of terminal strip P (see figure 4). I replaced the 100Ω resistor with a 1.2K Ω10W unit. I then connected the wire from pin 7 of the rectifier socket to the new pin 1 of the P terminal strip. (See photo.) Pin 7 of the rectifier socket serves as a tie point for bringing the filtered B+ to the cap sections for the front end. In addition to the resistors shown, I connected pin 7 to the extra section of the twist lock.

Figure 6 shows the schematic for the high voltage, small value cap bypass caps at the rectifier. Solid state rectifiers inject RF into the amp, and the small-value caps provided a path to ground. You might protest that the caps are unnecessary, as there are chokes downstream in the power supply. The chokes effectively block 60 Hz. However, at radio frequencies, they are essentially capacitors, and allow the noise to pass through without much attenuation. The caps at the rectifier provide a low-impedance path to ground for any RF that may come from a noisy power line or be generated by the rectifiers. I used ceramic disks across the rectifiers, and a polyproplyene from B+ to ground.

Inrush current limiters

I ran across this part in the Digi-Key catalog some time back (look in the index under Thermistors, Inrush Current Limiters). These are thermistor devices whose resistance is high when at room temperature and drops to a much lower value when warm. The part I chose is rated for a maximum current of 3 amps, at which the resistance is supposed to drop to 0.5Ω. I measured a cold resistance of 60Ω, and a resistance of about 2Ω with a current of 1 amp, the amp's idle current (so the idle current voltage drop is about 2 volts). Note that the voltage drop should decrease as you drive the amp harder. Even if you use a vacuum tube rectifier, this device will control the initial current surge through the cold filaments when you first turn on the amp.

807 power

Why convert to the 807? The 807 is relatively cheap and plentiful (at least for now), as compared with the 6L6GC or KT-66. Converting to 807s allows me to use the amp on a daily basis for the long term without breaking my allowance. The transformer manuals from the late 1960's included schematics for various transformers, and typically list the KT-66, 6L6GC and 807 power tubes as all being appropriate for the same output transformers. One big reason why the 807 is still plentiful and cheap is that it is not pin-compatible with the other two tubes. The 807 is also cool looking, with its coke bottle shape and plate cap on the top. (VALVE members with a lifetime stash of Genelex KT-66 outputs do not have to bother considering this modification.)

The one drawback to this modification is that I had to drill one extra hole in the chassis, to move a terminal strip. I

FIGURE 2 STOCK W-5 POWER SUPPLY

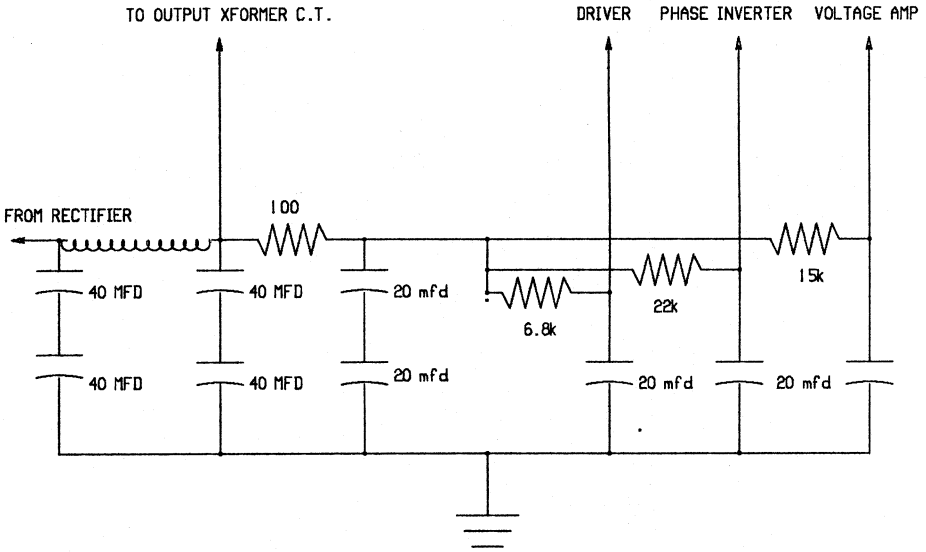


FIGURE 3 MODIFIED W-5 POWER SUPPLY

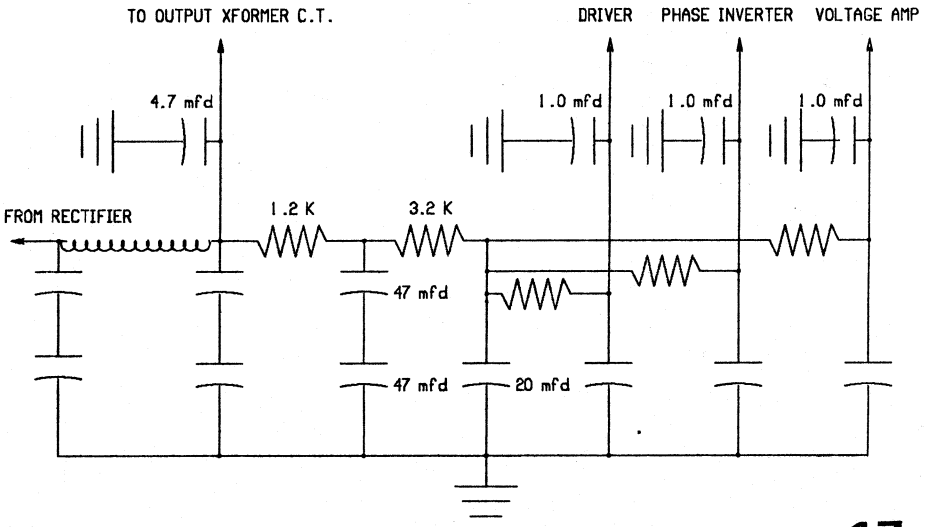
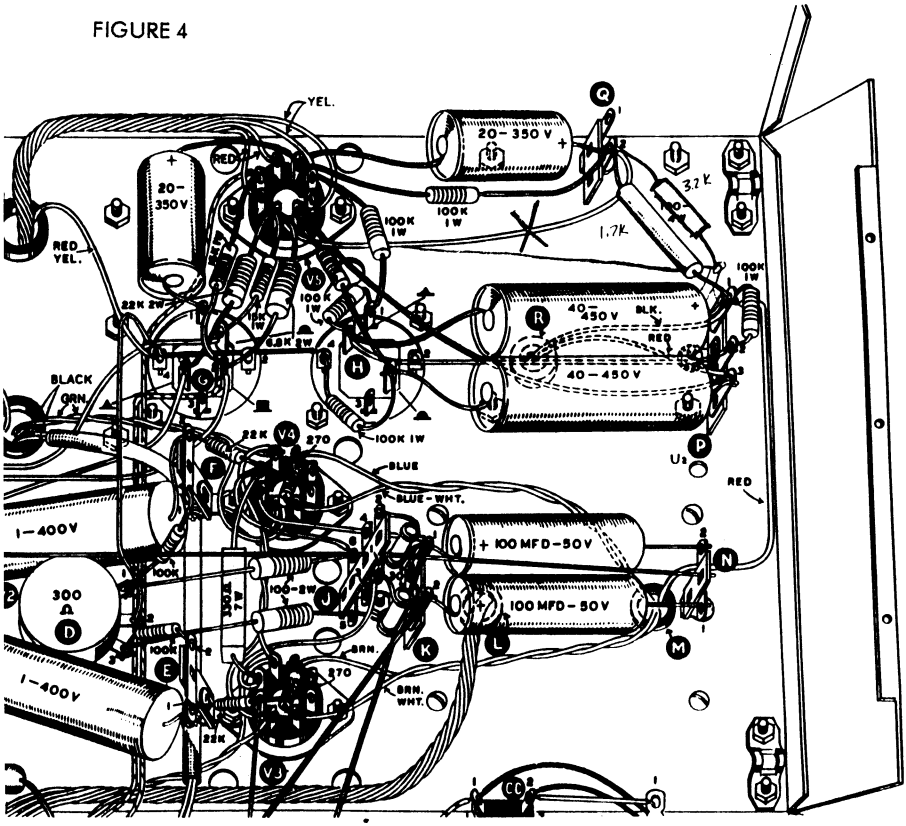


FIGURE 4


YEL.
20-350 V
RED
20-350V
100K 1W
100K 1W
3.2K
1.7K
100K 1W
RED YEL.
22K 2W
40-450 V BLK.
RED
40-450 V
BLACK GRN.
22K
270
100K 1W
BLUE
BLUE-WHT.
RED
1-400V
+ 100 MFD-50V
100 MFD-50V
300 Ω
100K
100-2W
BRN.
270
BRN. WHT.
1-400V
22K

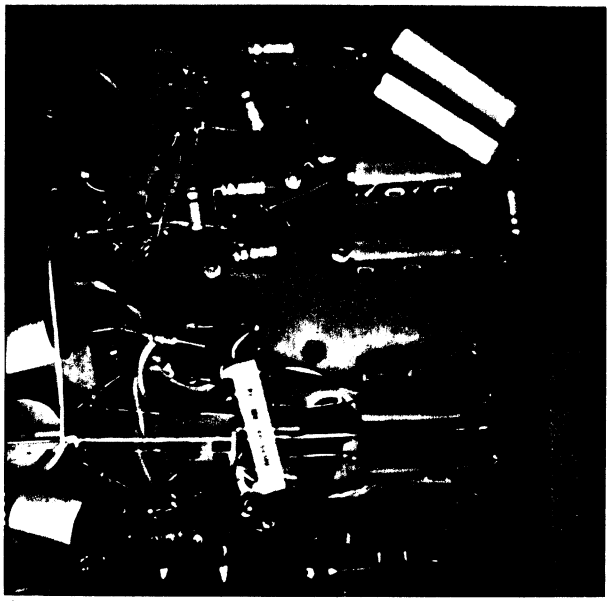
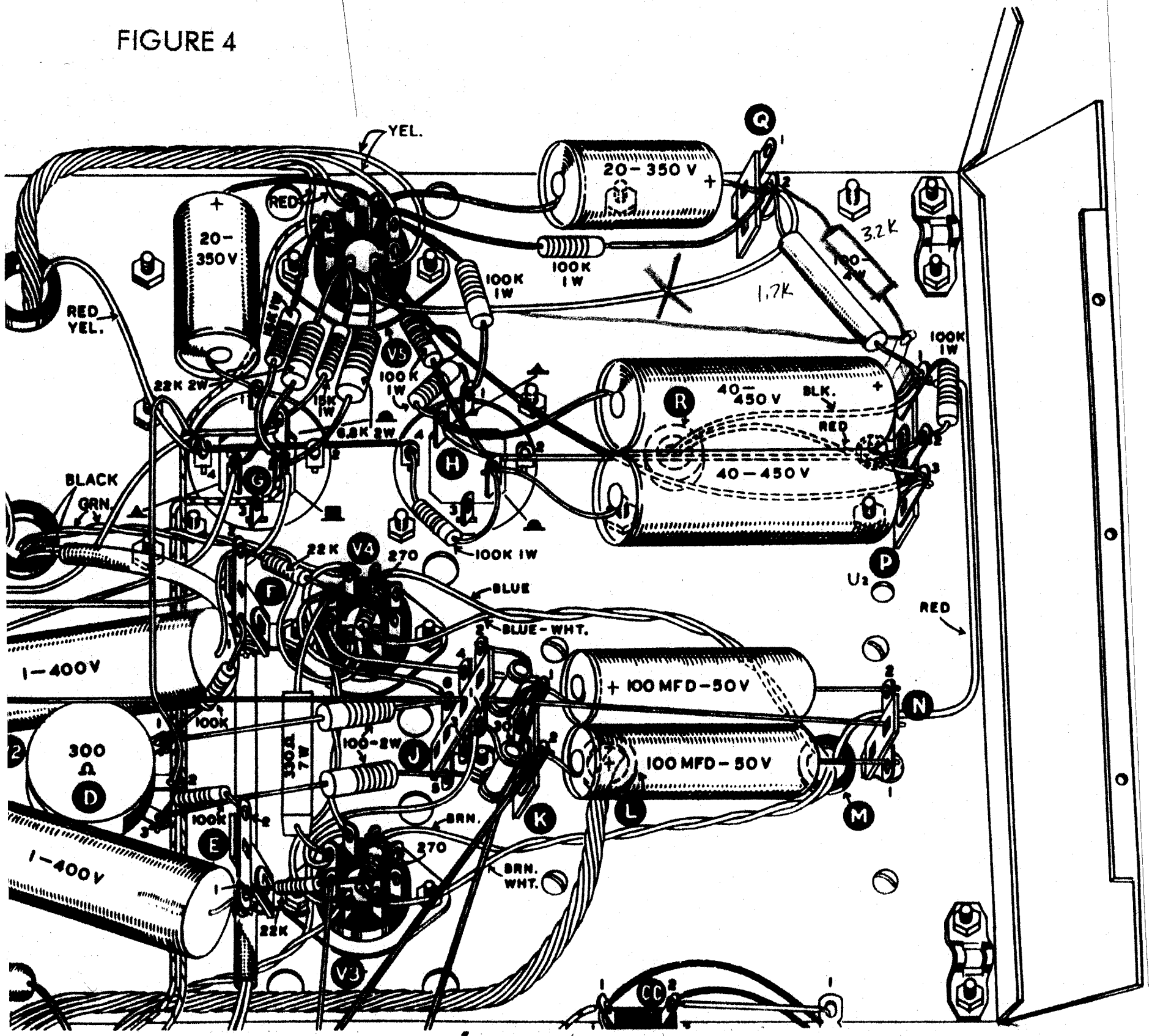
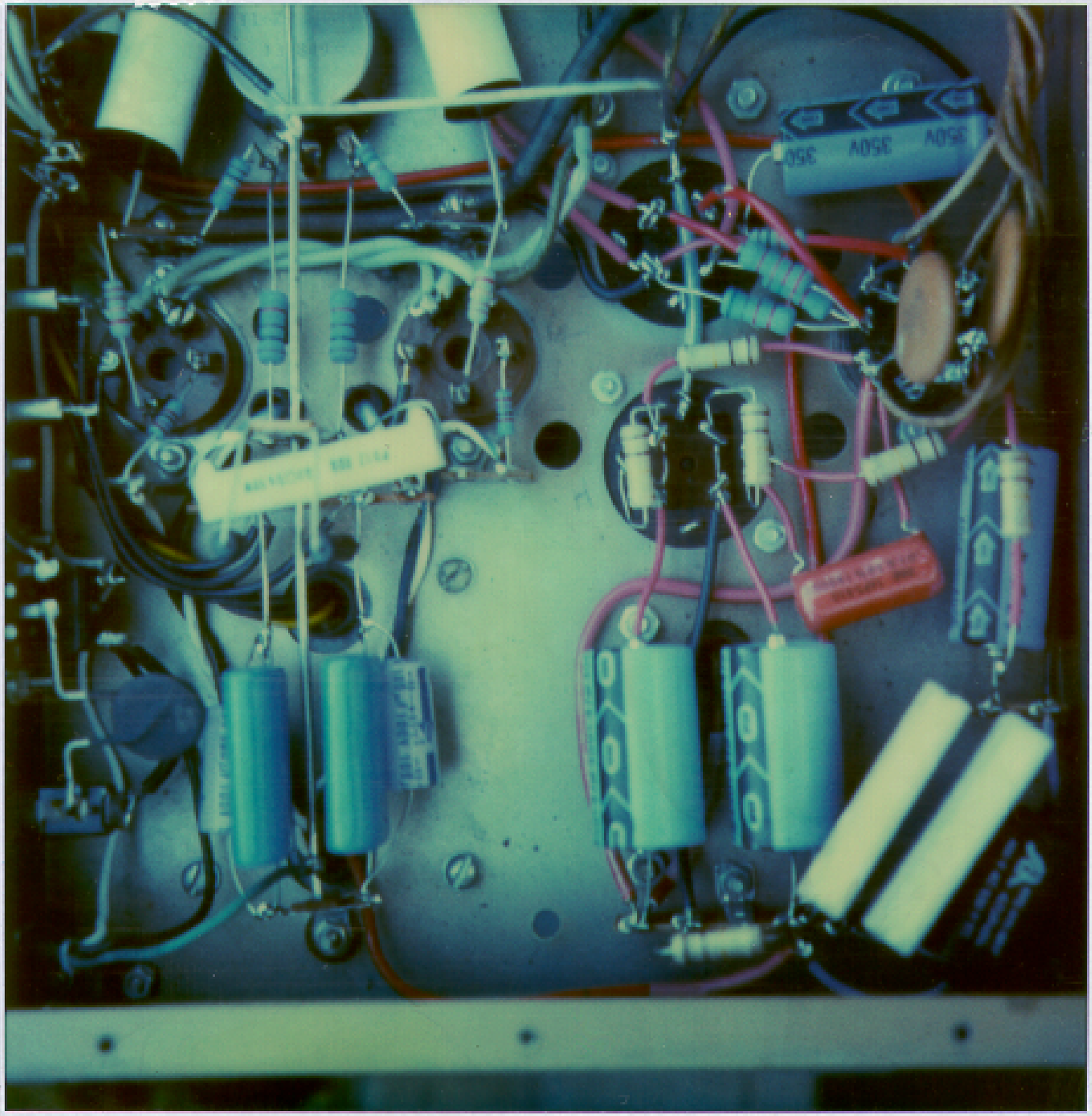
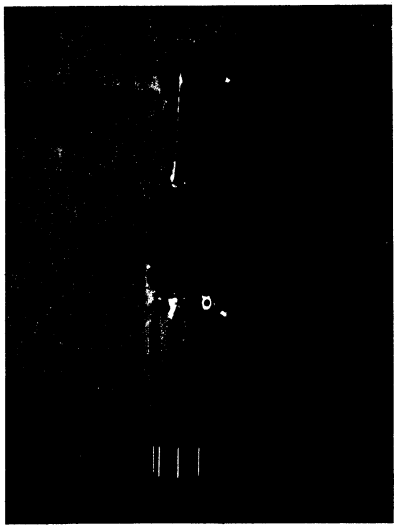


FIGURE 4


YEL.
Q
20 – 350 V
+
RED
20 – 350 V
100K 1W
100K 1W
3.2K
1.7K
100K 1W
RED YEL.
V3
100K 1W
22K 2W
15K 1W
6.8K 2W
R
40 – 450 V
BLK.
RED
40 – 450 V
BLACK GRN.
H
G
22K
V4
270
100K 1W
P
U2
BLUE
BLUE-WHT.
RED
1 – 400V
+ 100 MFD – 50V
N
100K
300 Ω
D
100-2W
J
100 MFD – 50V
K
L
M
100K
E
BRN.
270
1 – 400V
BRN. WHT.
22K
V5
CC



routed the plate leads out through the existing ventilation holes (see photos). I installed grommets in those two holes, and the physical space required for the grommets required that I drill a new hole for terminal strips J and K, back by about 1/4 inch (see figure 4). In addition, I mounted a terminal strip on each 807 tube socket to serve as tie points. The stock wiring topology takes advantage of unused pins on the KT-66 sockets as tie points, and you lose those when you install 807 sockets. I tied the ultralinear leads from the output transformer to the terminal strips. I then wired the resistors from those points to the screen grid terminals on the 807 sockets (these are barely visible in the photos).



another possible mod

There is one possible modification that I did not do -- make the rectifier wiring compatible with use of the 5AR4 rectifier (the 5R4 is standard for this amp). The 5R4 cathode is the filament itself ("directly heated"), so it does not control the B+ turn-on surge like the 5AR4, which has a cathode separate from the heater. However, the 5AR4 cathode connects to pin eight, and the W-5 takes the B+ off pin 2, at the other side of the heater and 5 volt winding. One could conceivably modify the wiring at the rectifier socket to take the B+ off pin 8. I might have considered if I had thought of it in time. However, the wiring is somewhat cramped at the rectifier, and the layout lends itself to taking the B+ off at pin 2. (See Figure 4.) For each amp, I opted to construct a "5AR4 converter." I wired together an octal tube socket and octal plug, crossing the wires for pins 2 and 8 (and wiring the filament pins, 4 and 6, straight through). See the picture.

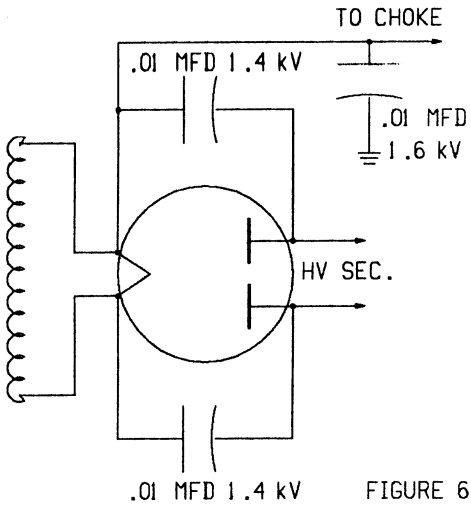
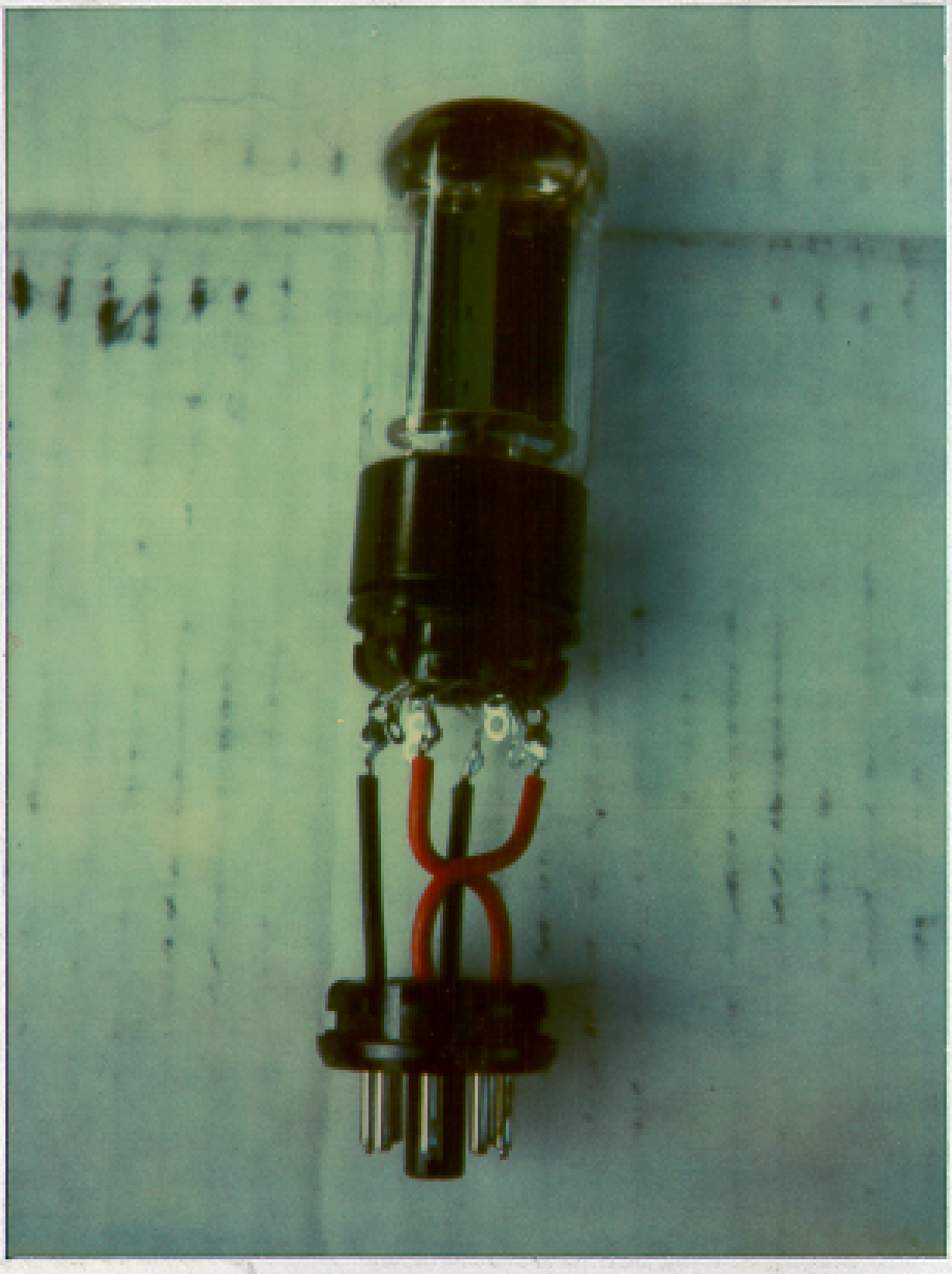


FIGURE 6

so how do they sound?

They sound good to me, but people often think their own projects sound great. Perhaps our editor would care to offer some less-biased views.

Come to Rick's May 7, and judge for yourself!



may

Rick told me he is finishing the last details of his system for our audition. Craftsman 500's will be running the Altec 311 horns; Heath W-5's the A7/515 woofers; a Luxman active crossover will divide, and he may run Audio Concepts subwoofers with a HK Citation12.

He's also purchased a nice Stanton cartridge to go with the SME/TD124.

This will be a MEMBERS ONLY meeting. The meeting will take place Sunday May 7th at 10 a.m. Call Dan at 360-697-1936 for directions and membership information. If you are a subscriber and would like to attend, you may upgrade to full membership for $15.00.

This system is gonna cook!

june

June's meeting will actually be held Saturday, May 27, from 6-9 p.m., at Nuts About Hi-Fi, This is the fabulous high end audio store I rave about all the time. The one that has the $100,000+ reference system. Owner Bill Benson and I will be coordinating a night of Tubes & Art. Activities may include a new show of art by local artists, demonstrations of the top line of Cary products (I got to prehear the Cary 805, 211 SE, running the X-1's, very cool) and Sonic Frontiers gear, a presentation by a representative from one of these companies, and a clinic sponsored by ELECTRONIC TONALITIES. That's right, bring in your best, and Dave and I will run a response curve for you, check your tubes, and generally offer advice on your equipment's performance. Bill will allow you to audition your equipment with some of his fabulous speakers, CD transports, DAC's, etc. and hear how great it sounds in concert with high end gear.

Along with the art we would like to display great vintage gear. Please bring your prettiest, shiniest gear to display for the evening! It will be in a secure display, and need not be operational. Call me and let me know what you'll bring.

april recap

April's meet was another all day affair.

We started with an audition of my Both Ways speaks. I set them up in my living room (14'x24'x 8.5', very live) and everybody had a listen. The common response was that people were impressed with the efficiency, and would like a bit more vertical dispersion. This can be done! Jerry brought some recordings he had made with his Sony DAT recorder, quite nice. The best recording was of Mozart's Requiem (I think). We felt that the presentation with the speaks was a bit dull. After the meeting I removed tape I had put on the cones to damp some edgy highs. They had broken in and the edge was gone. I suspect that a relisten would show a vast improvement.

From here we went down to the shop and listened to Greg's 70W RCA theatre amps, running the Magnepans. They were nicely restored and sounded quite good. Greg was surprised that people liked them!

My intention was to run the Altec 1569A's we brought next, but I couldn't get them together. I got one going a couple days after the meeting, and it's very nice. Sounds like it puts out way more than 80W.

The final setup was Steve's MI 200's running the Maggies. The power trannies are so noisy that we had to listen to loud stuff only. Jerry was finally pleased with the presentation of his Requiem tape with 200 troide watts! A real wall cracker.

For both these amps we used a prototype Carver tube reference preamp that Dave brought. It was bigger than most of the amps auditioned, two huge chassis. Quite nice, with a very nice phono preamp.

I thought the MI 200/ Magnepan combo sounded the best that day, but Steve Schneider and I AB'd Both Ways/ Triophoni and the MGIIA's/MI200's in the shop a bit later and I liked the small system better. Guess I need a system for every day of the week. dan