

# VALVE

VINTAGE AUDIO LISTENERS AND VALVE ENTHUSIASTS

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**Big Mac attack- the MI 200**

**6L6 shootout results**

**More FM tuner mods**

**Books for constructors - part II**

**Great donation to library**

## **upcoming meetings**

November 13, 1994  
Mac MI 200's, JBL Hartsfields,  
KLH 9's and more  
at Steve S's, 10 a.m.

December 4, 1994  
Rectifier Shootout & Christmas Party  
at Classic Radio, Poulsbo  
12 noon

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november  
1994**

# VALVE

*is the newsletter of*  
Vintage Audio Listeners and Valve  
Enthusiasts

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

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to plus, and they can kill you along  
the way if you're not  
careful. Vintage audio equipment  
operates at potentially lethal  
voltages. Always treat it with  
respect.*

## editor's thing

Howdy. Hope this new text font is easier on your eyes. I splurged and bought an upgrade to the DTP program I've been using, and this is the first benefit.

Well fall has definitely fallen, and I find myself in a state of inspiration as the days cool down and get shorter. It sounds like this mood is pretty widespread, as I hear from many members about their winter project plans. One advantage of winter in the Great Northwest is that it's pretty easy to find an excuse to stay in the basement and create.

One of my main objectives this winter is to start our LEDE Listening Room Project in the old garage. The radio cabinet restoration end of my business has picked up like crazy this month, so I'll be splitting time this winter between working for a living and construction.

With luck we'll have an inaugural audition in the spring. A Live End - Dead End room has sound absorptive material covering the 'front end' of the room and reflective and dispersive material at the back. Eric has volunteered to help with electrical and sheetrock. We could really use help with anything from painting to carpet installation, and a materials donation would be appreciated most of all. You guys are always so helpful with info, equipment and enthusiasm that I know I can count on everybody for a little help!

Considering that our gross income this year has just covered newsletter production costs, with yours truly donating the rest of the operating capital, I think we've done pretty well in getting equipment to audition and a place to do it. With a real listening room, we shall do some serious testing and listening. Thanks in advance for your help.

Don't let the blue smoke out,

## letters from fred

*great recollections from Fred Suf-  
field, P.E.*

*This month Fred offers up a list of  
classic texts to add to our 'Books for  
Constructors' list:*

2 Oct. 94

Dear Dan,

Thought that a little different approach  
this month would be good.

Every Engineer, Tinkerer, or Experi-  
menter should have a library. Outside  
of Playboy there are several other  
books of value.

Probably the best one for those in the  
Audio field is the great Australian con-  
tribution by Langford-Smith, *The Radio-  
tron Designer's Handbook*.

In addition to the various Terman books,  
the *Radio Engineering Handbook* by  
Keith Henney, McGraw-Hill, the latest  
issue available, is always a good bet.

An overlooked one is *Vacuum Tube Am-  
plifiers*, by Valley and Wallman, *Radiation  
Lab. series, Vol: 18*, McGraw-Hill.

Another sleeper, yet excellent, is the  
*Electronic Transformers and Circuits*, by  
Reuben Lee, John Wiley & Sons.

An interesting approach is *Graphical  
Constructions for Vacuum Tube Circuits*,  
Albert Preisman, McGraw-Hill.

And for someone who likes a little vec-  
tor math, the *Frequency Modulation* by

August Hund (which translates roughly  
to Auggie Doggie - dan), McGraw-Hill,  
is a little read volume.

Now this assumes that everyone has the  
tube manuals, and several of the older  
ARRL handbooks.

A good book is like an item of good test  
equipment, one enjoys using it and rely-  
ing upon the results.

And I almost forgot, for those who want  
to design their own filters and cross-  
overs, *Simplified Modern Filter Design*,  
Phillip Geffe, Hayden Book Company.

Hope this is of interest,

Best regards,

### a threat

OK you "I'm a vintage hi-fi buff" girly  
men. No more mister nice guy. You  
wieners sit around talking bottles like  
you invented them, but you don't have  
the sand to write one measly morsel for  
this newsletter. I can't be the only one  
who's getting tired of reading page af-  
ter page of my pap, and even as cool  
as Fred is, he can't be the only other  
person in the club with a working  
knowledge of the English language.

Besides, if you write an article it in-  
stantly qualifies you as an Expert. Peo-  
ple will regard you as One Who  
Knows, and seek You out. People will  
give You stuff for free and invite You to  
witness their most coveted possessions.  
So get your finger out and use it to type  
me a letter, an article, hate mail or  
something. Otherwise I'll start publish-  
ing pictures of my family. I swear.

# 6L6 torture test

## Class A<sub>1</sub> Amplifier

MAXIMUM RATINGS	6L6		6L6GC		
	Design-Values	Center-Values	Design-Values	Maximum-Values	
Plate Voltage	360	360	500	500	volts
Grid-No.2 (Screen-Grid) Voltage	270	270	450*	450*	volts
Plate Dissipation	19	19	30	30	watts
Grid-No.2 Input	2.5	2.5	6	6	watts
<b>TYPICAL OPERATION</b>					
Plate Voltage	250	300	350	350	volts
Grid-No.2 Voltage	250	200	250	250	volts
Grid-No.1 (Control-Grid) Voltage	-14	-12.5	-18	-18	volts
Peak AF Grid-No.1 Voltage	14	12.5	18	18	volts
Zero-Signal Plate Current	72	48	54	54	mA
Maximum-Signal Plate Current	79	56	66	66	mA
Zero-Signal Grid-No.2 Current	5	2.5	2.5	2.5	mA
Maximum-Signal Grid-No.2 Current	7.3	4.7	7	7	mA
Plate Resistance (Approx.)	22500	35000	33000	33000	ohms
Transconductance	6000	5300	5200	5200	μmhos
Load Resistance	2500	4500	4200	4200	ohms
Total Harmonic Distortion	10	11	15	15	per cent
Maximum-Signal Power Output	6.5	6.5	10.8	10.8	watts

\* In push-pull circuits where grid No.2 of each tube is connected to a tap on the plate winding of the output transformer, this maximum rating is 500 volts.

## Push-Pull Class A<sub>1</sub> Amplifier

MAXIMUM RATINGS (Same as for Class A<sub>1</sub> Amplifier)

TYPICAL OPERATION (Values are for two tubes)

Plate Voltage	250	270	volts
Grid-No.2 Voltage	250	270	volts
Grid-No.1 Voltage	-16	-17.5	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	32	36	volts
Zero-Signal Plate Current	120	134	mA
Maximum-Signal Plate Current	140	155	mA
Zero-Signal Grid-No.2 Current	10	11	mA
Maximum-Signal Grid-No.2 Current	16	17	mA
Effective Load Resistance (Plate-to-plate)	5000	5000	ohms
Total Harmonic Distortion	2	2	per cent
Maximum-Signal Power Output	14.5	17.5	watts

## Push-Pull Class AB<sub>1</sub> Amplifier

MAXIMUM RATINGS (Same as for Class A<sub>1</sub> Amplifier)

TYPICAL OPERATION (Values are for two tubes)

	6L6	6L6GC	
Plate Voltage	360	360	450
Grid-No.2 Voltage	270	270	400
Grid-No.1 Voltage	-22.5	-22.5	-37
Peak AF Grid-No.1-to-Grid-No.1 Voltage	45	45	70
Zero-Signal Plate Current	88	88	116
Maximum-Signal Plate Current	132	140	210
Zero-Signal Grid-No.2 Current	5	5	5.6
Maximum-Signal Grid-No.2 Current	15	11	22
Effective Load Resistance (Plate-to-plate)	6600	3800	5600
Total Harmonic Distortion	2	2	1.8
Maximum-Signal Power Output	26.5	18	55

## Push-Pull Class AB<sub>2</sub> Amplifier

MAXIMUM RATINGS (Same as for Class A<sub>1</sub> Amplifier)

TYPICAL OPERATION (Values are for two tubes)

Plate Voltage	360	360	volts
Grid-No.2 Voltage	225	270	volts
Grid-No.1 Voltage	-18	-22.5	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	52	72	volts
Zero-Signal Plate Current	78	88	mA
Maximum-Signal Plate Current	142	205	mA
Zero-Signal Grid-No.2 Current	3.5	5	mA
Maximum-Signal Grid-No.2 Current	11	16	mA
Effective Load Resistance (Plate-to-plate)	6000	3800	ohms
Total Harmonic Distortion	2	2	per cent
Maximum-Signal Power Output	31	47	watts

## MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1	megohm
For cathode-bias operation	0.5	megohm

October's meeting was another packed event at Classic Audio, with a few folks left standing. A couple of new members joined after the meeting, and I'm sure that a couple more folks who are starting to attend regularly will do so soon. We're really starting to grow!

I'll try to schedule half or so of our meetings on the Seattle side from now on. If you live on that side of the water and would be interested in hosting a meeting and showing off your system, let me know.

We got right down to the demo at hand because of its length.

Dave brought the McIntosh MC40 described last month and we fed it directly with a generic Japanese CD player with a volume control. It it turn fed a JBL speaker.

Everybody agreed to listen one more time to the good old *Wagner Without Words* CD. We're all learning it pretty well now and know what details and nuance to listen for, so in spite of the repetition, it seems to be a good choice for this group.

The tubes that showed up for the comparison were pairs of the following:

6L6G - Sylvania

6L6GA - Sylvania

6L6 (metal) RCA

1614 - RCA

5881 - Tung Sol

6L6WGB - Phillips (Sylvania)

6L6GC - RCA

6L6GC - Sovtek

KT-66 Mullard

5962

807 - RCA, in Myron's cool adapters

807W - Sylvania, ditto

All tubes were matched for transconductance and all types except the 5962 and Sovteks, which Dave brought, tested within 10% of each other, around 5500 micromhos on my TV-10B/U tube tester.

Each pair was plugged in, warmed up

very briefly and auditioned with the same two tracks of the CD (4&5).

I might as well admit my screw up on this comparison right here.

The MC40 was chosen because it was freshly redone and had no bias or balance pots to mess with. Unfortunately I failed to notice that it has a plate and screen voltage of 470 VDC.

The MC40 was designed to use 6L6GC's. This is the only tube of the group rated for such high screen voltage, so every other tube in the test was really being misused.

Surprisingly, only a couple of types really fell apart under the strain, those being the 5962 and the 807. The 5962 made scratchy arcing sounds on peaks, and the 807's put out these scary pops at seemingly random intervals. Mike mentioned having the same problem when trying 807's in a Mac MC30.

We were, however, able to draw some conclusions about the other tubes in spite of their torture.

The 6L6G and GA both gave OK, slightly soft and mushy presentations, with the GA slightly better. The metal tubes were less than impressive, with the 1614 giving a slightly brighter presentation than the 6L6. Once again please remember that these tubes were all being pushed beyond the limits of their screens, some by as much as 200V!

Moving on to the more modern tubes, I was surprised to find that I liked the most holy KT-66 least of all. It seemed a bit bass shy, and not as punchy as the others. Perhaps this is good, as there ain't no more anyway.

Enough with the stuff we didn't like.

The really cool sounds started happening when we plugged in the 5881's. Good highs, good dynamics, and pretty good bass. Ditto the Sovteks, with even better bass and dynamics.

I'd say these are a best buy right now. Dave really liked Sovteks. He had these in the amp when he came to the shootout, and left with them back in there

afterwards.

My personal favorites were the 6L6GC's and the 6L6WGB's. The 6L6GC's had great punch and lots of upper detail without being too harsh. I had come to use this particular pair as the tubes I plug into any 6L6 amp I have in the shop, and this test proved that they really did sound a little better than others I had lying around.

I think most people in the room really sat up and took notice at the Phillips 6L6WGB's, though. They had the smoothest, least 'pentodey' presentation and handled transients better than any other tubes. Most realistic and least strained would be appropriate descriptions as well.

Don't ask me where to find these. I got four from Eric a long time ago, and promptly broke one. If he has one more, I claim first dibs. If he has more than one, I doubt he'll want to let them go!

Actually the results were promising in terms of the high scoring of the more readily available tubes. 6L6GC's and to some extent 5881's are still findable, and the Sovteks are both reasonably priced and plentiful.

Someday next year we'll redo this test with a more appropriate amp. In the meantime, don't get too hung up on funky old tubes with high price tags and big globes. Try the more reasonable and modern tubes too. You may get a nice surprise!

-dan

## **november's meeting**

*Steve S. called me last night to confirm the date of November 13, 10 a.m., for our chance to have a look at his collection. Among the systems he will have to audition are:*

*-Mac MI 200's with a custom Roger Hug built power supply driving a pair of custom built Hartsfield's.*

*-Sonic Frontiers SFS-80 running KLH Nine ESL's.*

*-Eico HF-89 to switch in to the other systems.*

*Steve has a bunch of other cool stuff like Scott 280's, a Mac 275, and an Ampex 351.*

*Remember this is a **members only** meeting. If you haven't yet joined, now would be a great time to do so. You won't see this type of heavy vintage hardware anywhere else in the Seattle area, unless there's some closet collector I haven't found yet.*

*Call Dan at 206-697-1936 for directions.*

*Our library is getting pretty full of cool schematics, manuals, texts, catalogs, tube data and zines. Just look right to see a small fraction. It seems about time to organize this mountain of stuff and put out a directory, so you can pick out material you need a copy of, without having to try to get a hold of me to tell what we have (elusive, ain't it?). What I need is a volunteer type to come over some eve or weekend and help me suck down a few brews, spin some analog, and shuffle paper. Anybody game?*

## **honk if your throat expands exponentially**

Ran across some great stuff this month, including a pair of JBL LE175 drivers with H91 horns and L91 lenses. One is currently sitting atop the old Stretchorn. Woof and tweet are biamped, no crossover, with the Triophoni amps. A slight attenuation of the JBL gives a fairly honkless presentation, with lots of low level info and a slightly tubby bass. This is one loud mono speaker.

I think this is worth developing into our super efficient stereo demo system for single ended stuff. I'm rereading Bruce Edgar's articles and will attempt a new bass horn design with a bit less rolloff, as the JBL goes down to about 450 Hz and the Stretchorn has calculated mass rolloff frequency of approx 280 Hz.

I'll attempt to make a fairly straight bass horn, which theoretically gives a 6dB/octave rolloff on the top end, according to Dr. Edgar.

Then a 6dB/octave high pass filter for the tweeter (maybe 560 Hz) may blend the JBL in nicely.

Would appreciate some input on this design from horn guys.

## **the library -**

### *New items this month:*

Brook 12A - Sam's  
HK Citation I - Sam's  
HK Citation III - Sam's  
Dynaco FM-3 Manual  
Fisher 50A manual  
Fisher 55A manual  
Heathkit W4-AM manual  
Heathkit XO-1 manual  
McIntosh 50 W-2 manual  
McIntosh 50 W-2 review - Audio  
QUAD ELS service data  
QUAD ELS manual  
REL Precedent manual - FATI  
H.H. Scott LT-110 manual  
H.H. Scott LT-110 svc. bulletin  
H.H. Scott 265-A tech. bulletin  
H.H. Scott 4310 manual - FATI  
Peerless, UTC, Stancor, Dynaco and  
Acrosound catalogs

## **what's brewin' ?**

Rick has modified a pair of Heathkit W-5's to use 807's. He figures that there are so many 807's around (at least in his shop) that they are the way to go for daily use. His work is thoroughly crafted. The amps are set up for easy switching of rectifiers, and Rick has volunteered to bring them to the December meeting for a rectifier comparison.

Eric is negotiating for a pair of EV Aristocrats and will be experimenting with a few of the many driver combinations offered for use in these cabinets.

After replacing 42 caps with polypropylene ones, the Citation I preamp starts to sound better. Metal film resistors to reduce the intolerable hiss will be the next step. After each mod I A/B it against a PAS 3 and an Apt/Holman, which sound quite similar. The gap is closing, and most new parts may make the Citation as civilized a preamp as the others.

## dinkin' around

*tech tips and other unsolicited advice*

### more FM tuner tweaks

This month I will delve into some mods for FM tuners that are more extensive than the tube swaps discussed last month.

The first thing I should say is that there is no point in doing any mod until the stock tuner is properly aligned, with proper operating voltages at the tube pins and good tubes. Unless you're getting top performance from the stock unit you can't judge the value of any mod you perform. Sam's Photofacts are the place to look for alignment info on many tuners, unless you have something very sophisticated like a Fisher FM 200-B or FM-1000. These units had very detailed procedures in their service manuals that are slightly different than standard procedures and use of these procedures can give better results. Check our library for tuner data.

The areas for improvement can be divided roughly into five groups:

- Power Supply
- MPX/Audio stages
- IF/Limiter/Demodulator stages
- Mixer/Local Oscillator stage
- RF stages

Power supply mods for tuners will follow the same approach as those for any other audio gear, increased filter capacitance (with consideration given to current limitations in rectifier tubes), Soft Start Fast Recovery Rectifiers for tuners with solid state rectification, and conceivably, although I haven't seen it done, regulation. The recent work published on RFI reduction in solid state rectifier circuits should be most applicable.

Multiplex and output stages deal with audio signals, therefore replacement of signal path capacitors in these stages with quality polypropylene or oil-filled caps would be a good bet. If the multiplex unit uses 12AX7's or 12AT7's, some tube swapping might improve sound quality. Telefunken's were popular in the really high end brands and there's probably a good reason for it. Remember that everytime you change a tube in a tuner it's a good idea to try touching up the alignment of the stages before and after the tube. Some times it makes a difference.

One other thing to check in the output stage is the accuracy of the de-emphasis network, which flattens out the high frequency emphasis put into the transmitted audio signal to improve the high frequency signal to noise ratio. The network consists of a resistor and capacitor at the output. The product of their values ( $R \times C$ ) should equal 75 microseconds.

Foreign tuners often have 50 microsecond de-emphasis networks. I recently fixed this on my 'brought home by a GI from the Orient' Kenwood L-07T and it really smoothed out the treble.

IF and limiter stages need a different approach than power and audio frequency stages because of the signal frequencies involved. Stability, accuracy and Q of capacitors in these stages are more important than their audio quality, so ceramic, silver mica, and sometimes polystyrene caps are more suitable for use in these stages. Unless you feel knowledgeable about the proper usage of caps in these stages, you are better off leaving them stock.

Tube substitutions are a possibility in the IF and limiter stages. I have noticed some improvement in stage gain (not necessarily a critical issue in IF stages) by subbing 6136's for 6AU6's on some tuners, and RCA was using 6HR6's and



6HS6's in their last tube manual tuner circuits, so they may work also.

Another area for experimentation is in the discriminator/detector/demodulator/ whatever stage. Tuners using diodes for this stage may benefit from replacement of original diodes with diodes of the same type number, chosen for lowest forward resistance.

I've also seen several old articles on substituting 1N34 diodes for 6AL5 tubes by plugging a diode into each pair of tube socket holes corresponding to the plates and cathodes in the tube. One diode goes from pinhole 7 to pinhole 1, and the other goes from pinhole 5 to pinhole 2. Banded ends go in pinholes 1 and 2, respectively. I've tried this on an Ampex tuner. I got more gain, but I can't say that audio quality was any better. I suspect hacking 6AL5's into tuners with diode detectors might actually 'tube up' the sound a bit!

Oscillator/mixer tubes may be swapped for similar types as well, but I've had little luck with this. I tried substituting a 6GH8A for a 6U8, which are notorious for wearing out, on a Scott 350D, with disappointing results.

I spoke last issue about tube swaps in the RF stage, so I won't flog the point here.

Instead, make your first RF improvement a good antenna. Radio Shack's FM only antenna is pretty good and dirt cheap. I've also used a couple of rhombic designs with good results, and someday I'll publish some neat log-periodic dipole designs I've been wanting to try.

When aligning your tuner, make the last touch up an adjustment of the antenna trimmers with the tuner connected to the antenna. This will trim the circuit very precisely to the actual antenna load. Trim it at the high and low ends of the dial, or if you only listen to stuff in a particular section of the band like I do, peak it broadly across that section.

A good way to boost weak signals is to add a preamp, which is essentially another RF stage. The best place to put a preamp is at the antenna, ahead of the relatively lossy lead in cable (use 75 ohm coax, and matching transformers if necessary, for least interference).

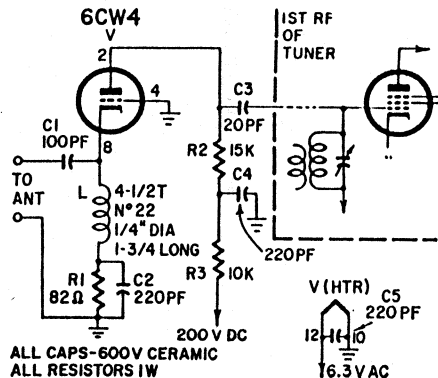
But if you want to stay all tube, it's easier to put the preamp at the tuner.

Or how about in the tuner?

Check out this cool mod from Radio-Electronics, May 1963, by Don v. R. Drenner.

A hole is drilled for a nuvistor socket as close as possible to the grid of the RF stage tube. Coil L1 is 4 1/2 turns no. 22 enamel, wound on a 1/4" dowel and sprung out to 3/8" dia. by 1-3/4' long. This coil is tuned by stretching and compressing it for max gain across the dial. Plate voltage at the nuvistor is supposed to be 80-100 VDC, so adjust R3 if plate supply voltage is much different than 200VDC.

Let me know if you try this circuit. I have rough plans for a more complicated tunable preamp using two nuvistors and coils etched onto a PC board if this is too easy! - dan



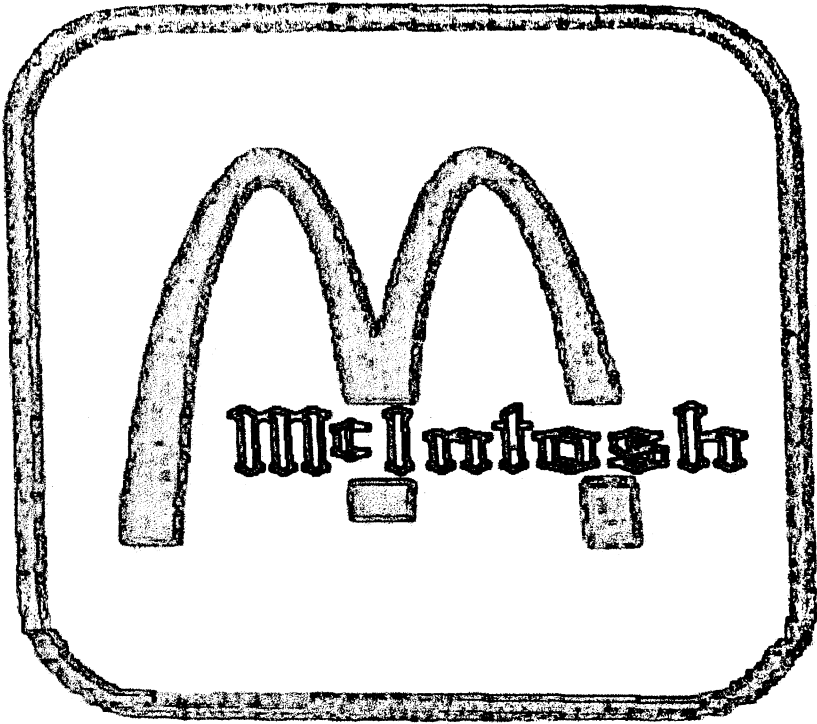


Photo of a very rare factory nameplate used on early MI 200's. The lettering is the usual chromed casting and the surrounding graphic is a mustard colored paintlike material. Reproductions are available with the purchase of a Happy Meal.

# big mac

**the MI-200 plays back with a thundrous attack  
cuts no slack and smokes like crack  
(a review by someone who shan't lack the knack  
to admit his opinion about a mac is worth jack)**

**Excerpts from the MI-200 Instruction Manual:**

"The McIntosh MI-200 is a 200 watt industrial power amplifier designed for such applications where high power and distortion-free performance is required. The model MI-200 designed for rack mounting, like all other McIntosh power amplifiers, uses the exclusive McIntosh high efficiency output circuit and bifilar output transformer to obtain its high standard of performance."

"Power Output: 200 Watts Continuous, with distortion less than 1.0%, 20-20,000 cps

Frequency Response: 20 to 20,000 cps+.2 dB at 200 watts output

Harmonic Distortion: Less than 1.0% at 200 watts output or less, 20 to 20,000 cps

Intermodulation Distortion: Less than 1.0% if instantaneous peak power is below 400 watts

Noise and Hum Level: 85 dB or more below rated output

Input level: Approximately .5 volts will drive the amplifier to 200 watts output.

Input impedance; 250,000 ohms

Output impedance: (MI-200A) 4,8,16,25(70.7 volts) and 600 ohms. Outputs may be operated balanced or unbalanced.

Output Damping Factor: 10 to 1 or greater 20 to 20,000 cps

Weight: 140 pounds"

"Tube Complement:

Amplifier Chassis:

12AX7 input amplifier

12AU7 phase inverter

2-6AV5 drivers

2-6BX7 drive cathode followers

2-8005 output amplifiers, cathode-plate loaded using the McIntosh unity coupled output circuit

Power Supply:

4-5U4 high voltage bridge rectifiers

2-5Y3 low voltage and bias rectifiers"

Yeah baby, this sounds like the amp I've been looking for to run my M<sub>6</sub>G<sub>1</sub>la's! Directly heated triodes, big mother output iron, all tube power supply, and 200 joules per second\* of sonic hellfire.

And what's extra cool is that it won't juice Corey Greenburg's lizard 'cause you can't buy it on sale at Radio Shack, so he won't get one, and Vinny Gallo will call it a Piece of Crap because it's not Western Electric or Levinson, so he won't get one, and I have TWO of them sitting in my shop and, and if that's not what determines if something is the Thing to Have, I've lost my thread.

Oh hell, I forget that some of you actually like to listen to things, use your brains, and form your own opinions. Sorry.

Look, to make it up to you I'll offer you a neat deal. You can hear a pair of these very rare and unique amps driving JBL Hartsfield clones at Steve S.'s on November 13. All you have to do is join the club. Then you can attend a very exclusive listening session and form your own opinion. To sweeten the deal I'll offer another chance to hear some MI-200's at my shop, running my MG-lla's, once I get through checking them out. Yes, these are Steve S.'s backup pair. This guy is serious.

OK, OK. Some of you really don't like to form your own opinions, and look to me as a sort of god of audio knowledge. So I will fulfill your tiny desires for 'quotes from those on the inside track'.

The MI-200, in my highly regarded and extremely influential opinion, does some things very well, some things OK, and other things not so well.

But seriously, the brief chances I've had to listen include a few minutes at Steve's, with the MI 200's running his Hartsfields, and a quick smoke check of one of his other amps running a Magnepan. The impression from both sessions was one of super real midrange and dull, even for triodes, highs, with power to burn. And way too noisy power transformers. The power supply belongs in another room or maybe over at the neighbor's. If these weren't such collectibles it would be fun to start modding them for more high end detail. Further listening may lead the way to some non destructive improvements like cap changes. Come see for yourself Nov. 13 at 10 a.m.

- dan



above: the business end of big mac  
right: 'Gee honey, wouldn't these make great end tables in the living room?'



*A note to Joe Roberts: Sorry I screwed up your name.  
Up here in Poulsbo everybody's name ends with 'son'.*

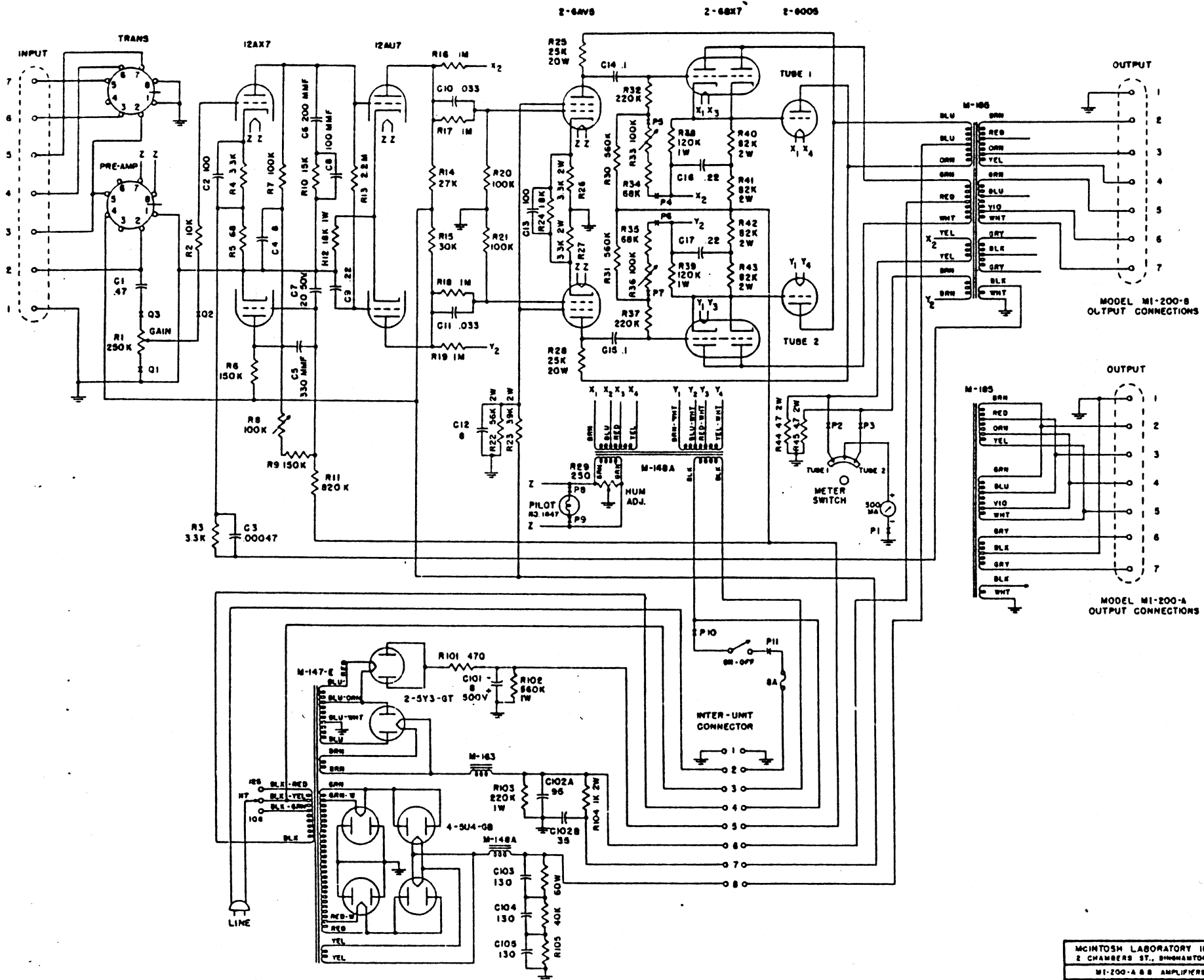
**all done**

\* I think that the use of watts output as a measure of amp performance may be going the way of tube counts in preamps. Nobody really believes that more of either is better anymore. Looking through my old Physics texts, which I saved from Beserkeley to remind me how much punishment the human mind can endure, I found some very useful conversions.

A watt = 1 Joule per second, which equals 1/746 horsepower. So if somebody tells you your MI 200 is overkill, tell them that it only puts out .268 hp, less than their Craftsman drill.

Single ended amp owners can use the fact that 1 Watt =  $10^7$  ergs/sec and confidently state that their single ended 10 output tubes are producing 9,000,000 ergs per second of power into each channel! (to get a clear image of this much power, imagine 9 million fleas farting into a Klipschorn)

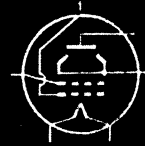
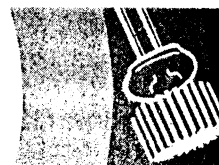
And remember that a 300B shows great taste, but contains less than two calories per serving. I mean per second.



038-004



# TRANSMITTING TUBE DATA

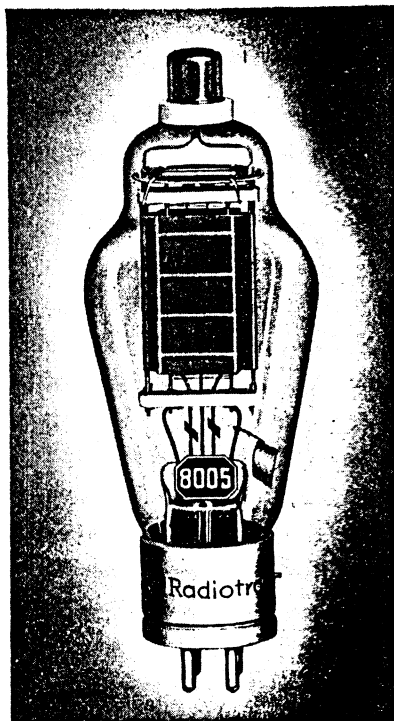


## TRANSMITTING TRIODE DELUXE

HARD-GLASS BULB; ZIRCONIUM-COATED ANODE

300 WATTS INPUT

List Price **\$7.00**



# 8005

"MINIATURE  
POWER  
HOUSE"

### Features

- **MOST POWERFUL OF THE SMALL TRIODES**  
Handles 300 watts input in a tube only 6 $\frac{1}{4}$ " high and 2 $\frac{1}{4}$ " in diameter.
- **LOW AMPLIFICATION FACTOR (20)**  
Low grid-drive requirements.
- **60-Mc OPERATION AT FULL RATINGS**  
100-Mc operation at reduced ratings.
- **EXCEPTIONAL DESIGN FEATURES**  
Zirconium-coated anode, 32.5 watt thoriated-tungsten filament, ceramic insulated plate cap, metal-shell base with ceramic insert.

RCA-8005 is the new small-size, high-power transmitting tube of the high-perveance type—most powerful of the small triodes. It has a maximum plate dissipation of 85 watts (ICAS) and a low mu of 20. RCA-8005 is designed for use as a radio-frequency amplifier and class B modulator. A single tube in class C telegraph service will handle 300 watts input (ICAS)—deliver about 220 watts of power—with less than 8 watts of grid drive. In plate-modulated service, will take 240 watts (ICAS) with only 9 watts of grid drive. In self-rectifying oscillator circuits, such as are used in therapeutic applications, two 8005's are capable of delivering an output of 250 watts when the circuit efficiency is 75%! In this application, as well as in general radio transmitter applications, the 8005 may be operated at maximum ratings at frequencies as high as 60 Mc and with reduced ratings up to 100 Mc.

The remarkable power handling ability of the 8005 is a result of a number of outstanding features not usually

found together in a single tube of this size. First, the tube is designed with a hard-glass bulb which is capable of withstanding high temperatures without cracking or collapsing. Second, it contains the famous RCA Zirconium-coated anode having high heat-dissipating qualities and effective getter action that functions to keep the tube *hard during its entire life!* Third, it is constructed with a ceramic plate cap insulator to minimize corona discharge. Fourth, the metal-shell base of the tube employs ceramic insulation to withstand high temperatures, extreme climatic conditions, and to afford adequate grid-circuit insulation at the higher frequencies. Fifth, the tube contains an extra heavy-duty, 32.5-watt, thoriated-filament having enormous reserve of emission.

RCA-8005 is designed and built for RELIABILITY. It will deliver the goods under the most severe conditions of operation—in all classes of service. RCA-8005 handles more power than any other tube of its size and class.

### TENTATIVE RATINGS

FILAMENT VOLTAGE (A.C. or D.C.)	10.0	Volts
FILAMENT CURRENT	3.25	Amperes
AMPLIFICATION FACTOR	20	
DIRECT INTERELECTRODE CAPACITANCES (Approx.):		
Grid-Plate	5.0	$\mu\text{f}$
Grid-Filament	6.4	$\mu\text{f}$
Plate-Filament	1.0	$\mu\text{f}$
MAXIMUM HEIGHT	6 $\frac{1}{4}$ "	
MAXIMUM DIAMETER	2 $\frac{1}{4}$ "	
SOCKET	Standard 4-contact, such as RCA type UR-542-A	

### TYPICAL OPERATION:

Unless otherwise specified, values are for two tubes

	CCS	ICAS	
D-C Plate Voltage	1250	1500	Volts
D-C Grid Voltage	-55	-70	Volts
Peak A-F Grid to Grid Voltage	290	310	Volts
Zero-Signal D-C Plate Current	40	40	Ma.
Max.-Signal D-C Plate Current	320	310	Ma.
Load Resistance (per tube)	2000	2500	Ohms
Effective Load Resistance (Plate-to-Plate)	8000	10000	Ohms
Max.-Signal Driving Power (Approx.)	4	4	Watts
Max.-Signal Power Output (Approx.)	250	300	Watts

As Plate-Modulated R-F Power Amplifier—Class C Telephony  
Carrier conditions per tube for use with a max. modulation factor of 1.0

**MAXIMUM CCS and ICAS RATINGS with TYPICAL OPERATING CONDITIONS**  
As A-F Power Amplifier and Modulator—Class B

	CCS	ICAS	
D-C PLATE VOLTAGE	1250 max.	1500 max.	Volts
MAX.-SIGNAL D-C PLATE CURRENT*	200 max.	200 max.	Ma.
MAX.-SIGNAL PLATE INPUT*	225 max.	250 max.	Watts
PLATE DISSIPATION*	75 max.	85 max.	Watts

	CCS	ICAS	
D-C PLATE VOLTAGE	1000 max.	1250 max.	Volts
D-C GRID VOLTAGE	-200 max.	-200 max.	Volts
D-C PLATE CURRENT	160 max.	200 max.	Ma.
D-C GRID CURRENT	45 max.	45 max.	Ma.