

## 1. Summary

Eminar 70W Bass Amplifier Type, S.N.2999. (5/4/1974 E.N.)  
April 2014.

### 1.1 Original Amplifier

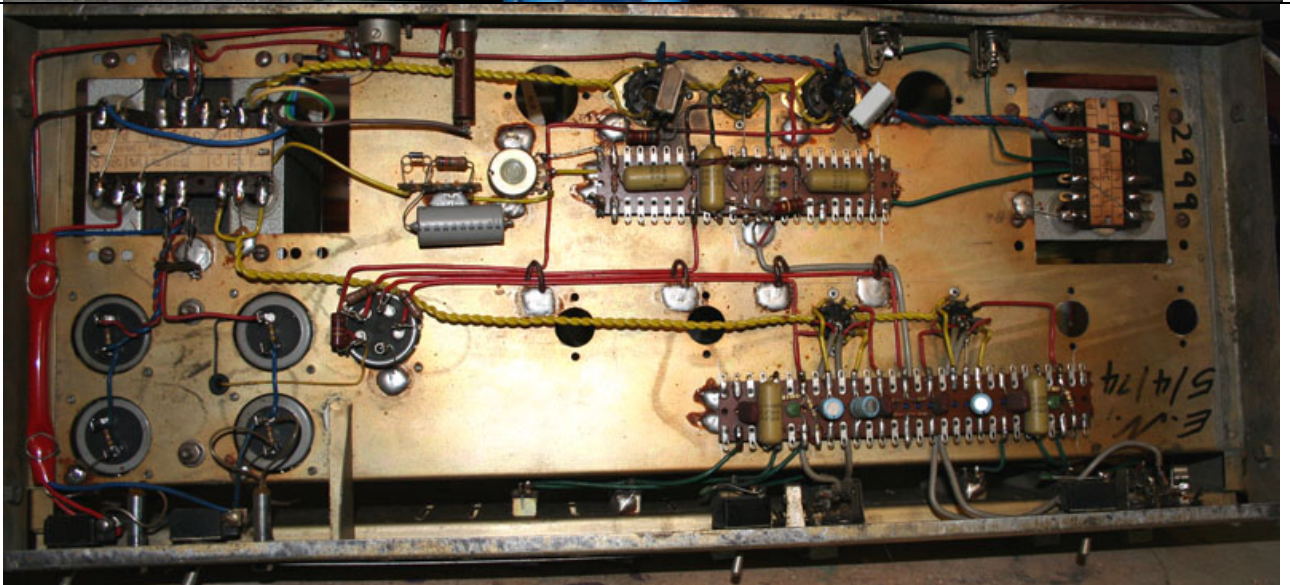
Two channel 70W Bass amplifier. 16 $\Omega$  speaker configuration. H200B fascia.

Output Transformer	TA2468; 46dbm (40W); 5K PP; 4/16 $\Omega$ outputs, with taps to allow 2 $\Omega$ and 8 $\Omega$ .
Power Transformer	TP5915. 0-120V, 0-120V; 235V 250mA DC; 125V 100mA DC; 6V3 CT 2A; 6V3 3A; 50V 100mA. Core size: 114W x 95H x 52D
Choke	KCH 18 Rola, 6H 100mA. 270 $\Omega$ DCR
Valves	EL34STR x2 Ruby 12AX7 x3 (UE 21; UB 20; UB 19)
POTs	Soanar sliders.
CAPs	ELNA 350V 10uF x2 (x4)

Chassis becoming quite corroded on top. Chassis used for all grounds. Pots and exposed parts dusty & oily. Original parts except output valves and 1x screen stopper. Cracked covering on 1x mustard and all 47NF red caps. Burnt screen wiring on 1x base. AC socket replaced. Mains and HT DC wiring in same spaghetti. PT HT secondary shorted turn – overheating. PT mounting brackets cracking. Missing handle. Particle board expanding in some areas due to loss of adhesion.

Very similar to Eminar P606 schematic by Stephen Bruce except: 6H choke replaces 2x 470 $\Omega$ ; 1k droppers replace 4k7; 1k bias replaces 220k; 10nF coupling to PI (not 63n); 1M grid leaks for PI (not 100k); 56k grid stoppers for EL34 (not 4k7; 2x EL34 (not 4x); 330pF treble & bright caps (not 33pF); 1k5 bypassed cathode for right input.





## 2. Modifications

- Replaced the power socket with an IEC socket.
- Separate ground for PE.
- Separated mains wiring.
- Added 431KD10 MOV across PT primary.
- Replaced faulty PT with AWA 52481 – reconfigured HT2 supply;
- 200Ω humdinger pot added, and 150V Zener with back-to-back 1N4004 for Vhk protection.
- Replaced each diode (probably stressed from PT failure) with 2 series UF4007.
- Replaced all electrolytic and red and cracked mustard capacitors. Reduced HT1 bleeds from 470k to 150k 2W.
- Added 10Ω cathode current sense resistors to EL34.
- Added bias bypass on pot wiper and 47k safety resistor, and 6k8 on low end, and 22k on high end to give 10V to 40V span. Effective grid leak =  $220+30+56 = 310k\Omega$ .
- Star ground for HT1, OT and one cathode.
- Star ground for HT2-3 and bias. Close to HT1 star ground.
- Star ground for HT4-5 over on front panel pots.
- Common chassis grounding retained for signal sockets, output stage cathodes, bias supply, external monitor, PI stage, POT covers, speaker feedback.
- Input stage sockets, tone and vol pots, grounded with bus wire to avoid poor socket grounding.
- Added 630mA IEC T fuse to HT1 secondary.
- MOV-R (431KD10 x2; 1k) across each OT primary for open-circuit output protection.
- Added two used matched 6CA7.
- Cleaned and repaired tolex covered cabinet. Added handle strap.
- Added 220k bypass resistor across standby: cold peak HT2 ~80V, lowering to ~45V hot. Choke transient voltage suppressor when standby contact opens.
- Measurement connector – 4 pin molex (100:1 HT1; gnd; V2 cathode; V1 cathode)
- Added 500k master volume pot with mixer before PI – using existing pot hole. This will slightly reduce sensitivity, but provide a point to kill the volume downstream of the two input stages and their valves.
- OT set up for 4 ohm speaker loading (Gauss and SWR cabs are each 4 ohm).
- Replaced Extension speaker ¼” socket with Speakon socket, and disconnected grounding switch on ¼” speaker socket (both Speakon and ¼” sockets are wired in parallel).

To do:

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Possible

- Add grid stopper to tone recovery circuits.
- Separate bias adjust pots.

Replacement PT from AWA PA1002. Model: 52481-3

Primary: 0-10-220-240V (BLU,GRY,OR,YEL)

Secondary: 185V @ ~400mA (RD,RD); 6V3 ~5A (BLK,BLK); 57V ~0.05A (VLT,VLT); 23V ~0.05A (GRN,GRN); Core size: 114W x 95H x 40D; Upright with steel bell-ends.

Removed bell ends and used TP5915 ends and terminal strip. Unsoldered Gry and OR to reduce leads. 24V winding not used.

Midpoint of HT1 taken to standby switch and then via 100Ω and choke to HT2. HT1 caps are protected from being forced negative at turn-off by the rectifier diodes.





### 3. Measurements

PT, OT and choke megger ok.

Voltage rail regulation. 240VAC tap. 0.33A mains

Rail	Idle	Turn-on	36W (12Vrms 4Ω)	60W (15.5Vrms)
HT1	510V / 3V	520V	480V	467V
HT2	248V / 0.22V	260V	233V	
HT3	226V / 10mV			
HT4	223V			
HT5	222V			
BIAS	-70V / -39V / -21V 29mA, 32mA (16W)		92mAdc	116mAdc
Heater 1	6.1V			
Sec HT	185V			

Power transformer primary DC resistance: 8Ω.

Power transformer secondary DC resistance: 11Ω.

Effective HT supply resistance = 20Ω. PSUD2 peak turn-on current:7A.

Output transformer primary DC resistance: 90+90 Ω plate-to-plate.

Choke inductance: tbd      270Ω DCR

50mV LHS input 1 for 30W output. Symmetrical clipping starts about 36W (clean up till then).  
About 55W cranked.

Both volume pots add in noticeable hum when touched by ungrounded hand and with wiper towards midway position, as the wiper knob is directly connected to the wiper (rather than to a grounded shaft).

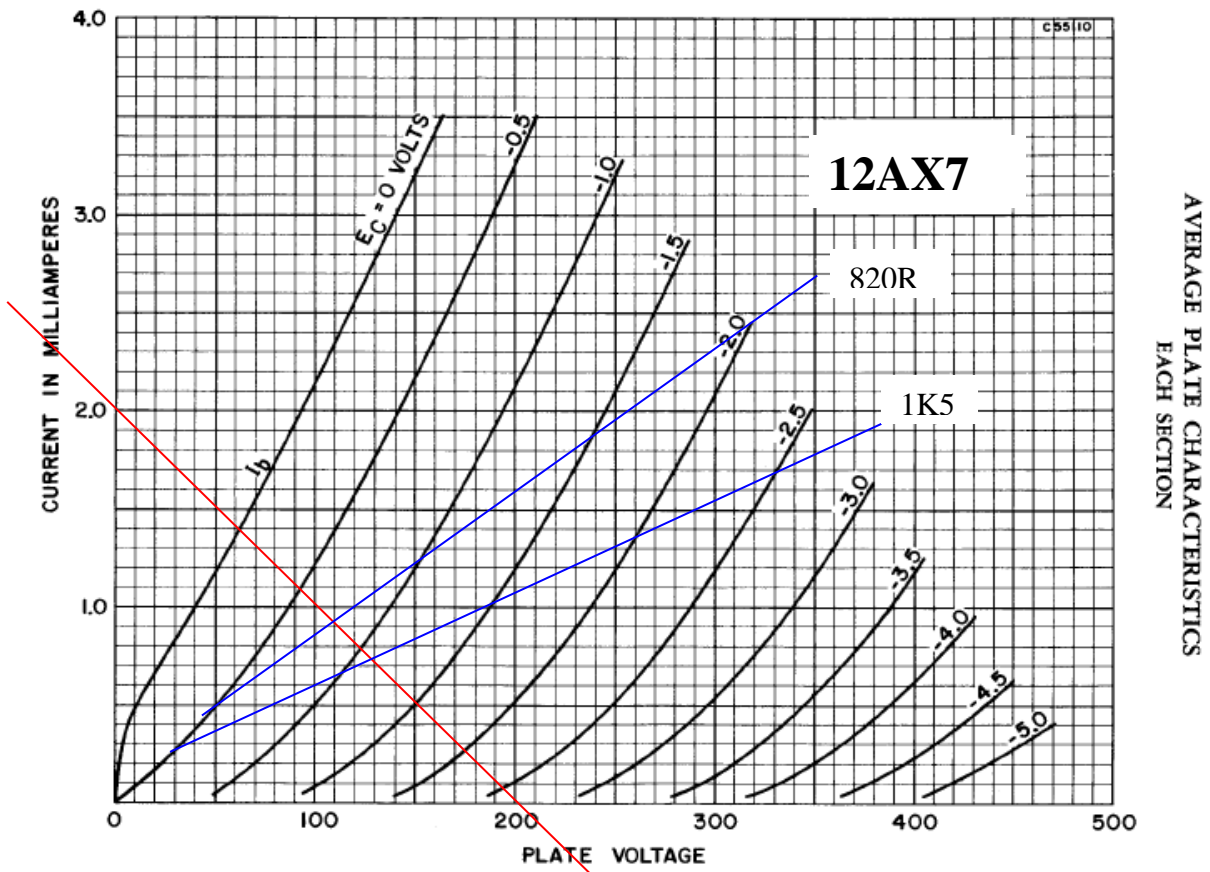
Bias currents level out at 32mA and 29mA with 503VDC.

Check:

- Clipping stage
- Output impedance change
- Tone settings
- Noise floor

## 4. Design Info

### 4.1 Input stage 12AX7

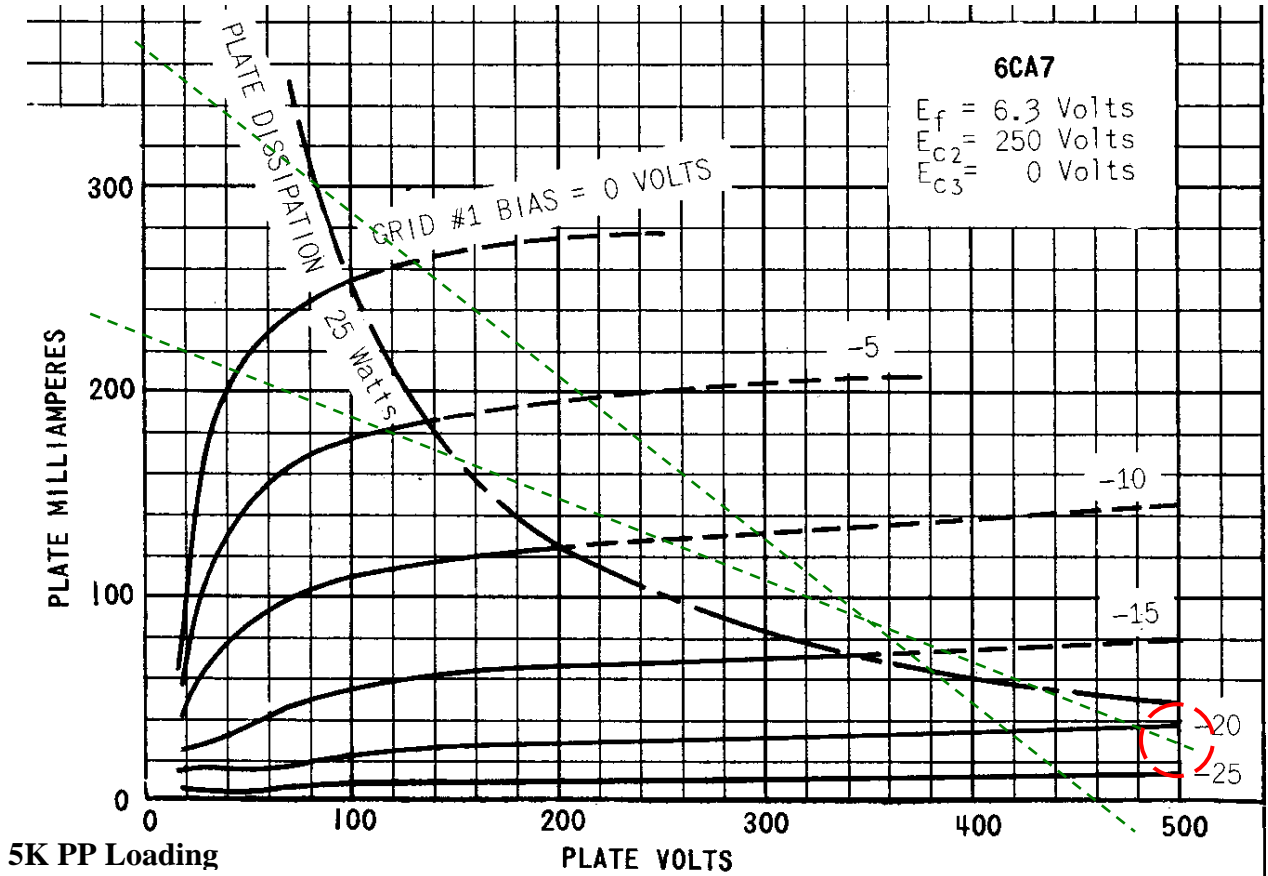


### 4.2 Output Stage

In this Class AB push-pull output stage the cathodes are grounded, and each 6CA7/EL34 tube operates in a fixed bias mode with a negative gate voltage. The 5KΩ impedance plate-to-plate OPT presents signal currents into each tube with a 2.5KΩ impedance with both tubes conducting, to 1.25KΩ load impedance at higher levels.

HT1 drop to Vak:  $(90+10) \times 0.25 = 25V$ .

Bias voltage set for nominal 30mA = 15W / 500V. Turn pot clockwise to increase current.





## 5. Power Supplies

Supply rails fall to 60VDC within a minute.

Heaters:  $2 \times 1.5 + 3 \times 0.3 = 3.9A$

Doubler rectifier with 100mA hot idle load on 500V VS1. Max anticipated continuous VS1 load current about 150mA. IEC60127-2 0.63A Time-delay fuse, as max continuous winding current could reach about 0.6Arms.

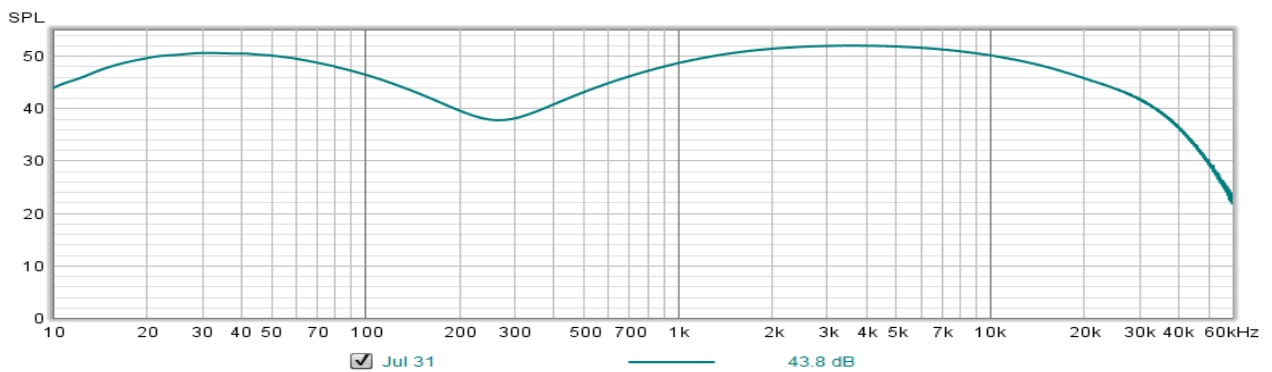
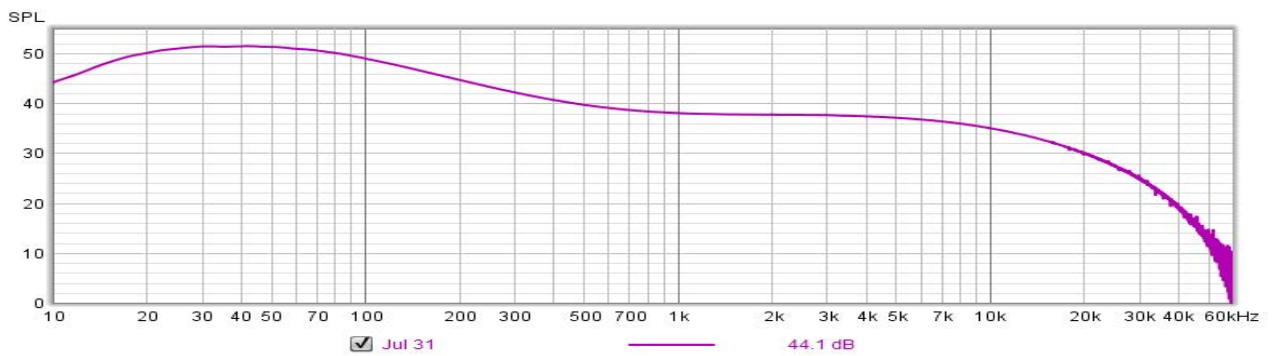
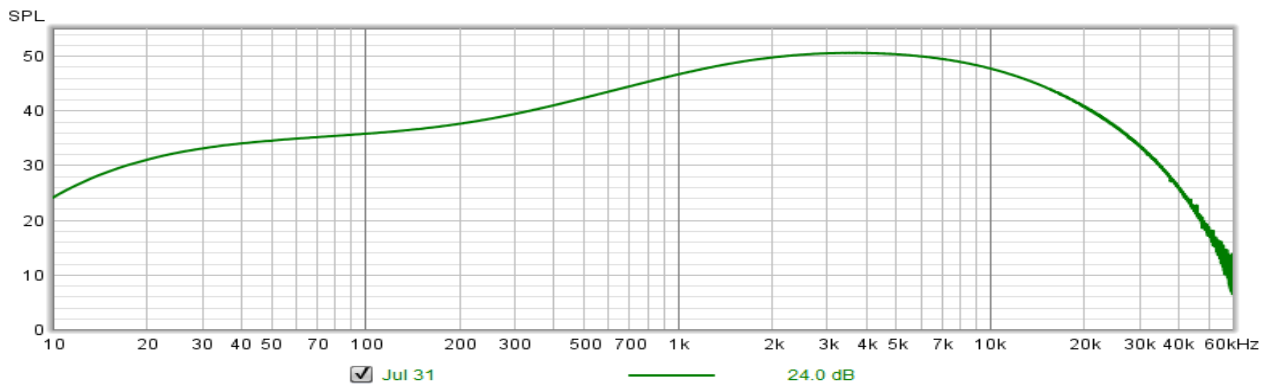
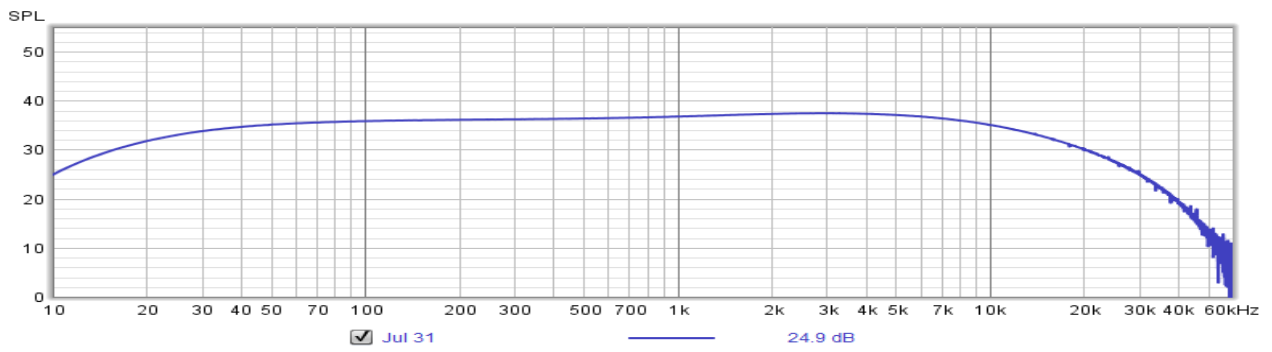
Simulate period in PSUD2	20ms	40ms	100ms	500ms	continuous
Simulated RMS current	3.3A	2.5A	1.7A	0.9A	0.6A
Multiplier (based on 0.63A fuse rating)	5.3	4.0	2.7	1.5	0.95
IEC60127-2 Time-delay min limit multiplier	10	~7	~4.8	~2.9	1

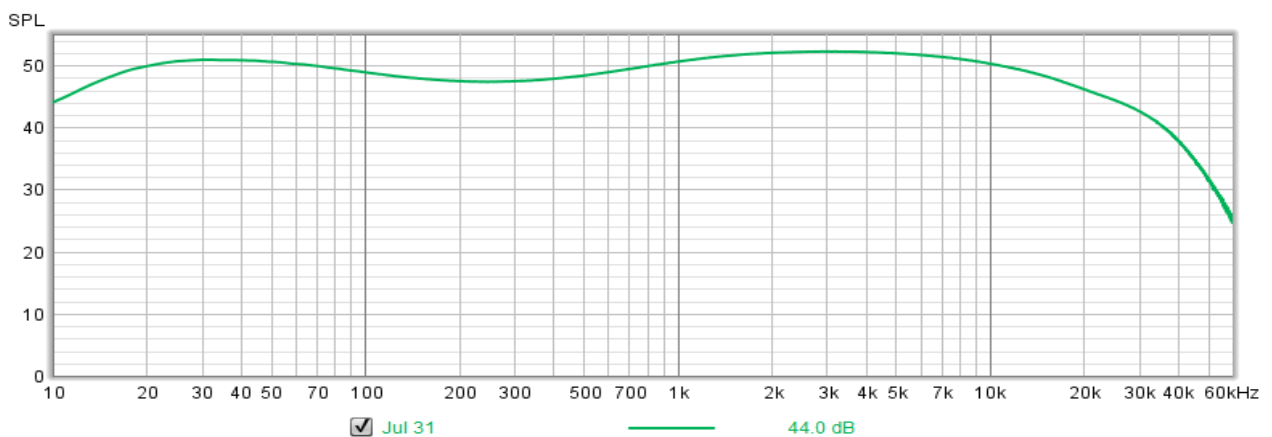
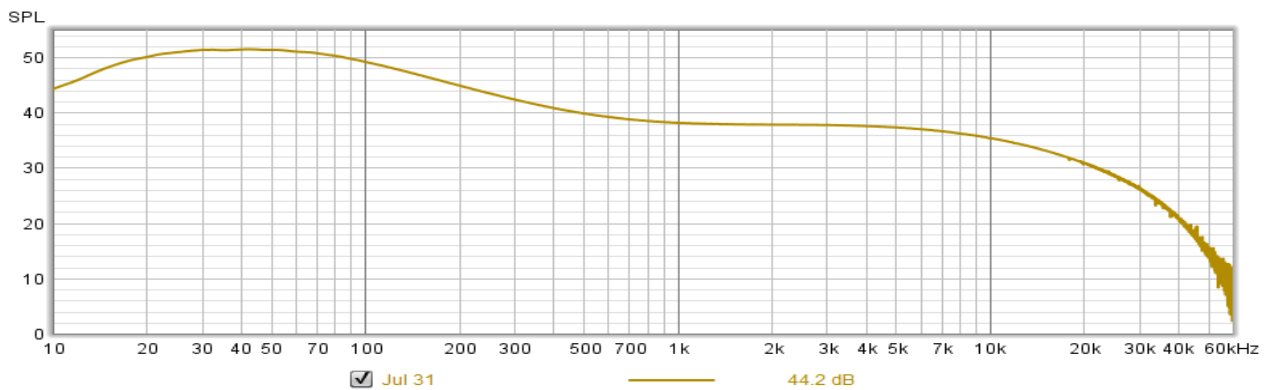
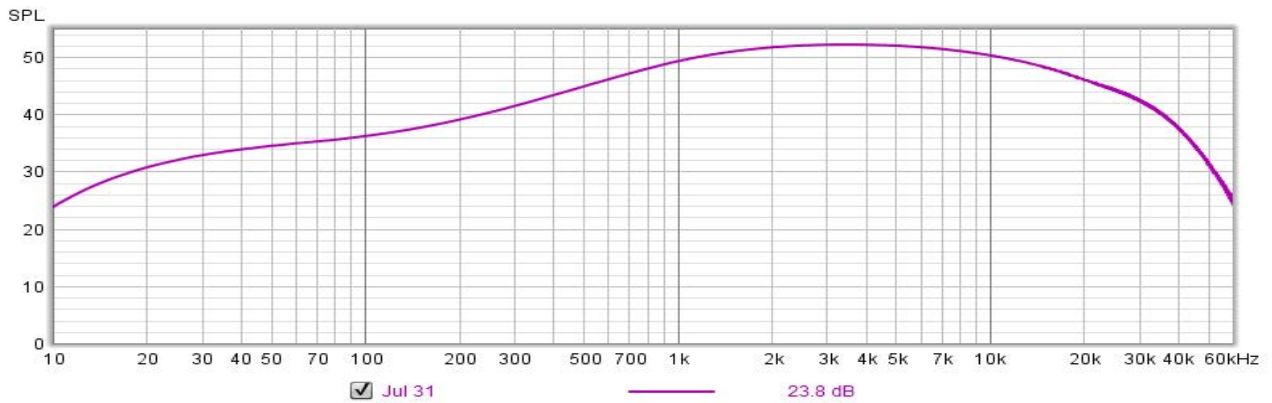
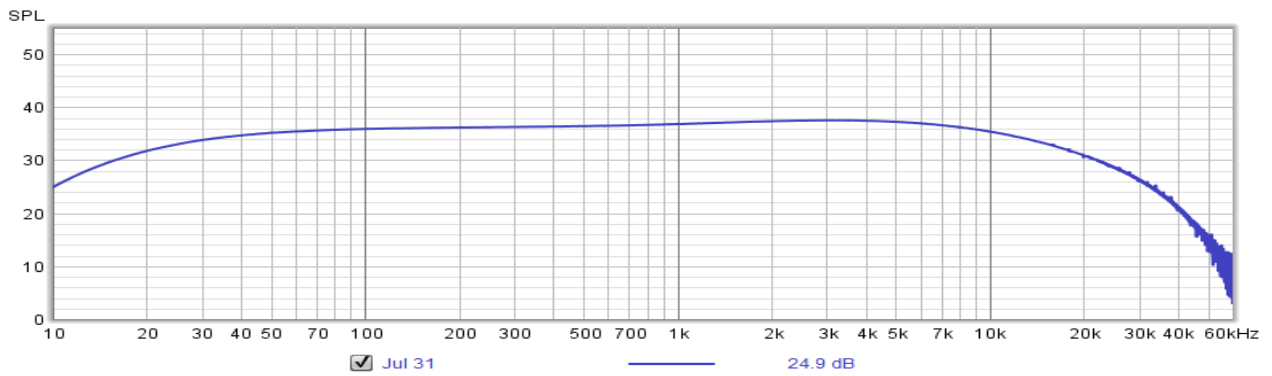
### 5.1 Bias Supply

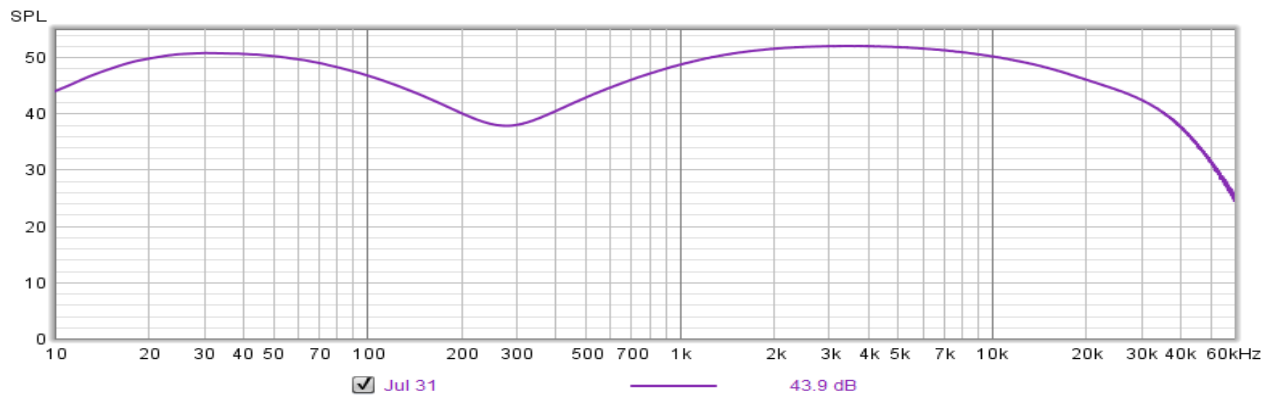
The bias supply is half-wave rectifier feeding a large buffer capacitor, then RC filtered via setting pot. Pot with safety resistor across top, and top and bottom resistors to restrict range to about 10 to 40V.



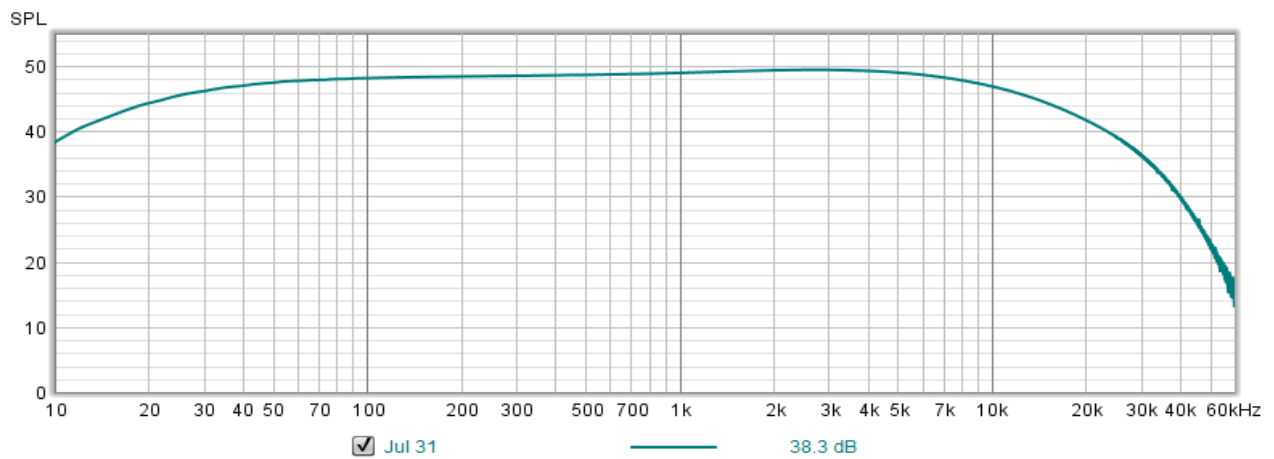
### 6. Response/spectrum plots



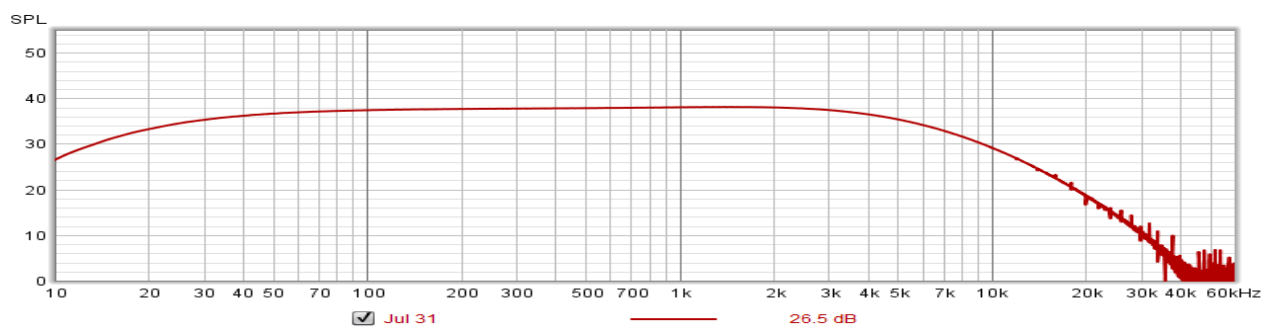




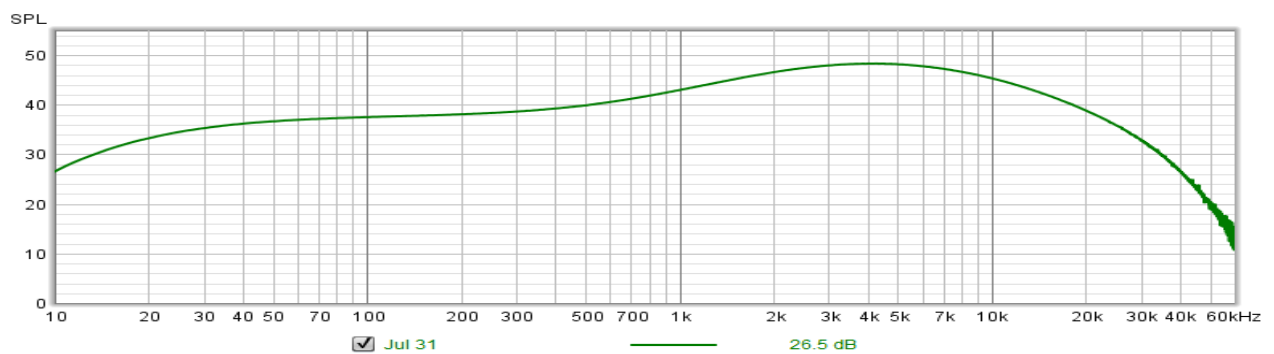
Right channel: Max Bass; Min Mid; Max Treble



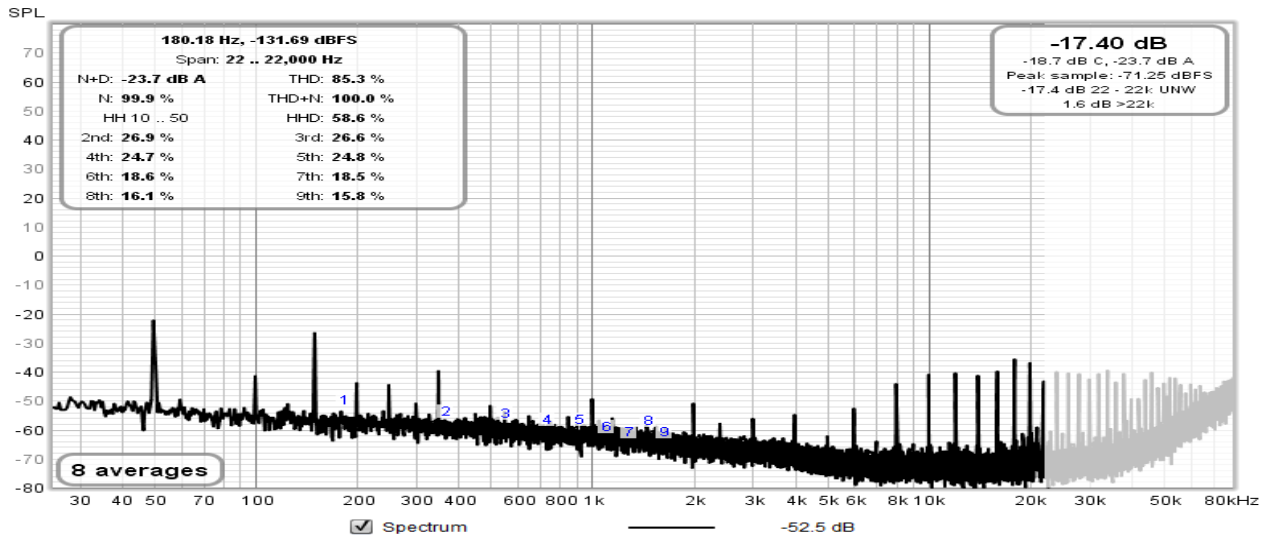
Right channel: Minx Bass; Max Mid; Min Treble



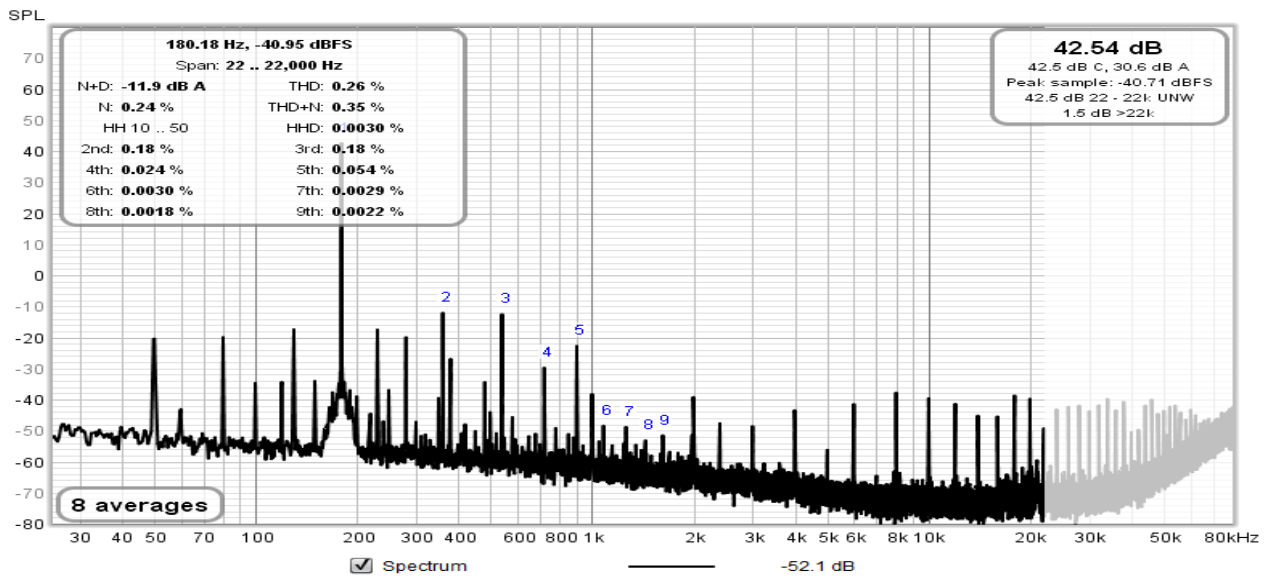
Right channel: Min Bass; Min Mid; Min Treble; Vol mid; HI off



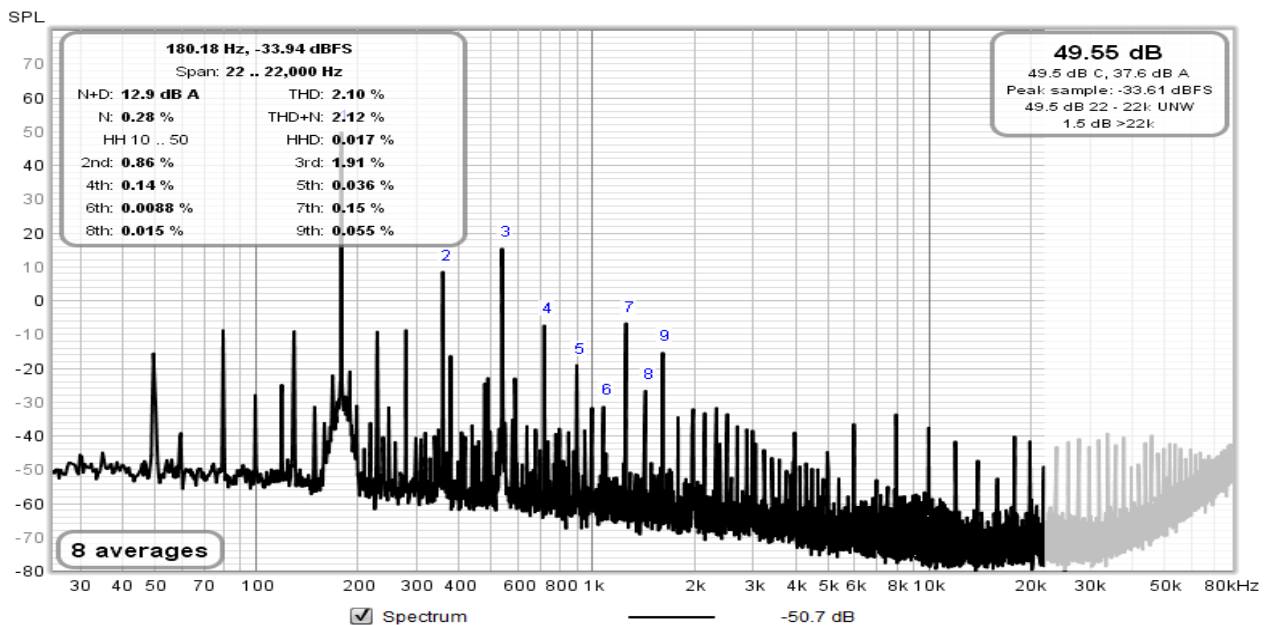
Right channel: Min Bass; Min Mid; Min Treble; Vol mid; HI on



Noise floor: pots min (EMU0404 noisy channel input)

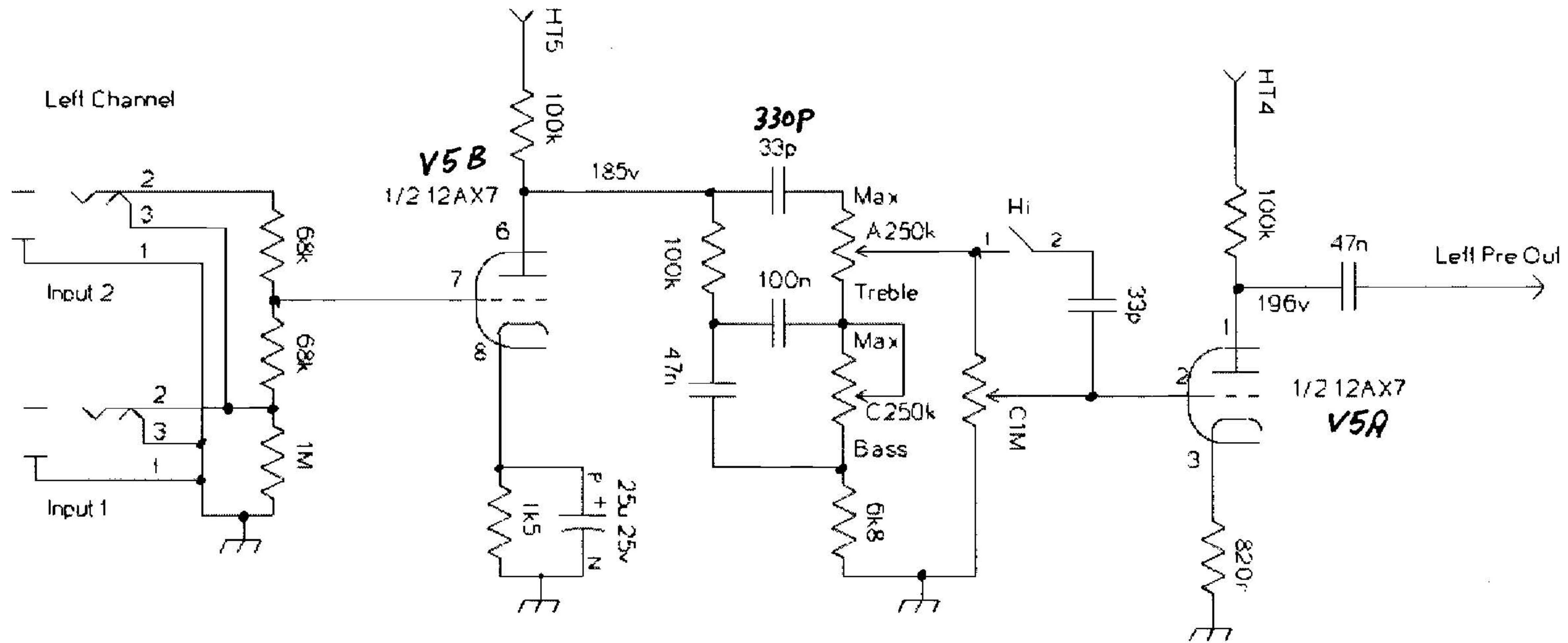


4W output

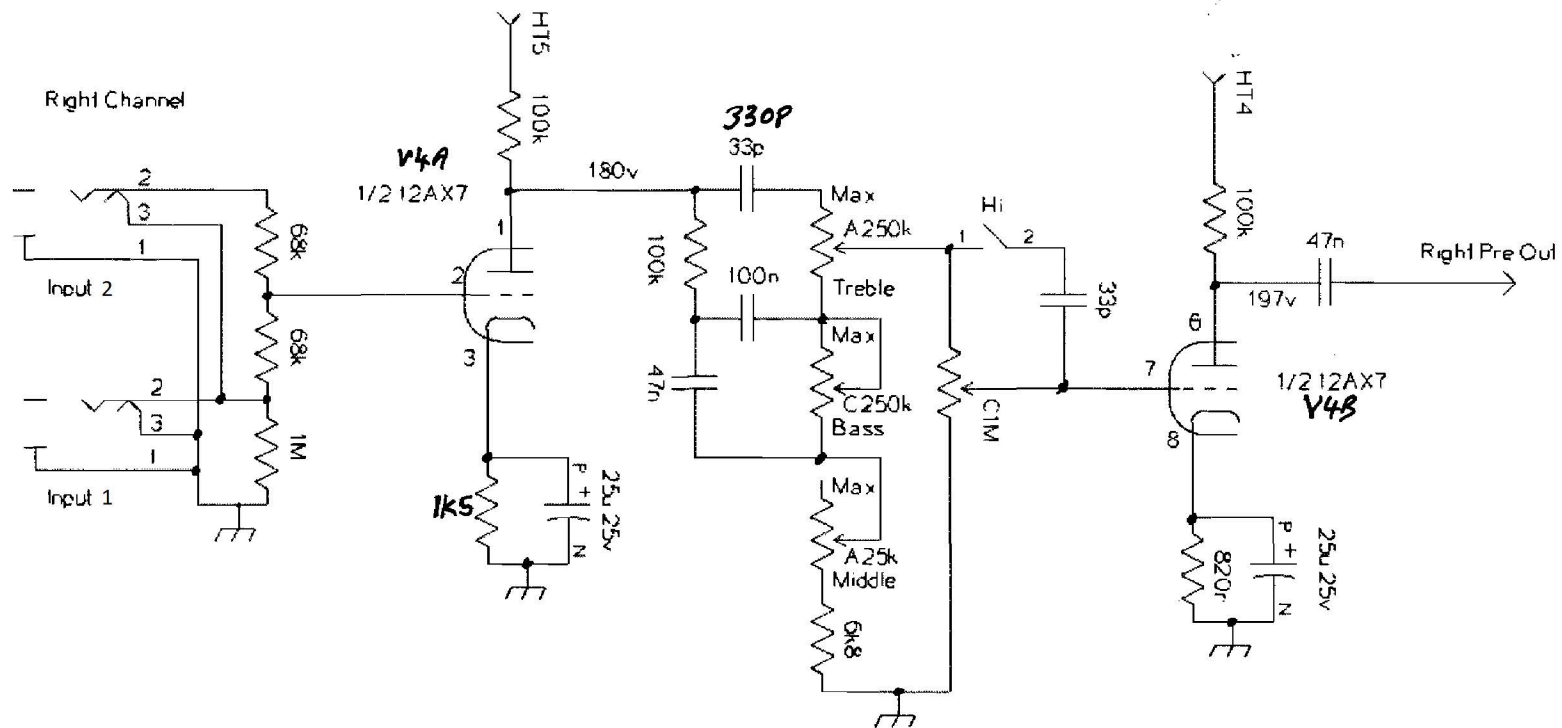


20W output

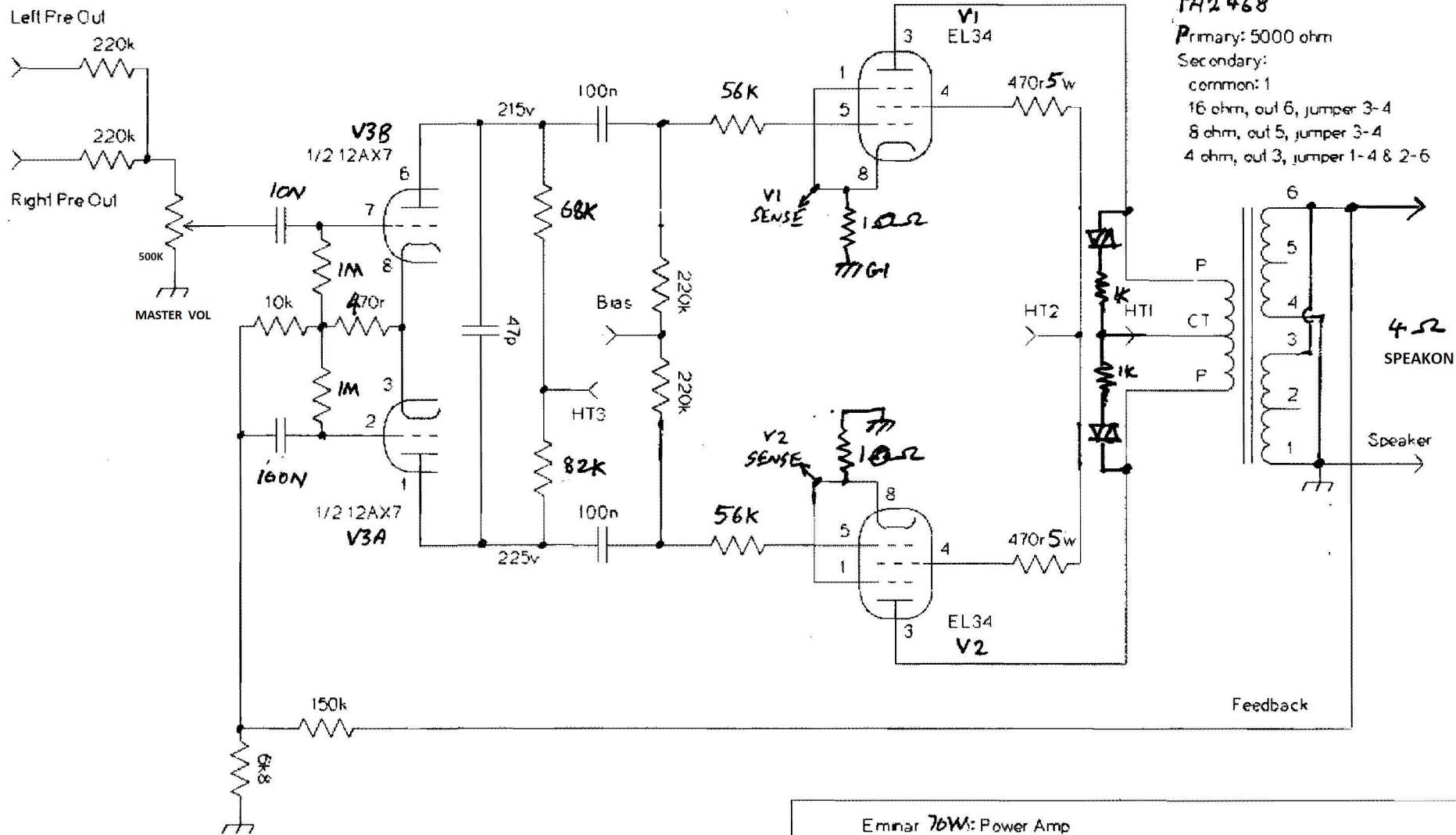




Emnar 70W - Left Pre-Amp		MODIFIED
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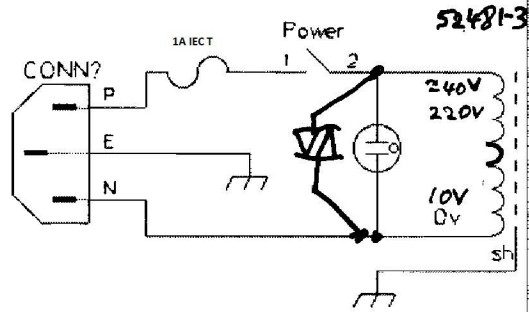


Eminar 70W - Right Pre-Amp		
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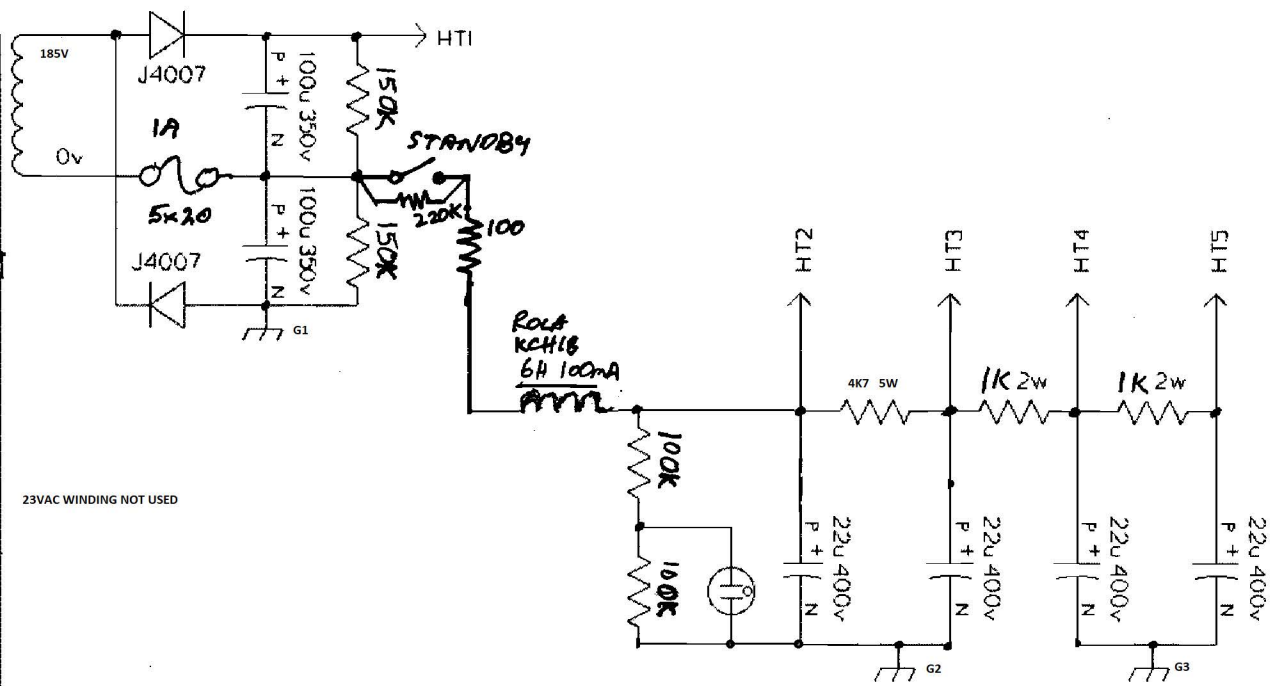


TA2468  
 Primary: 5000 ohm  
 Secondary:  
 common: 1  
 16 ohm, out 6, jumper 3-4  
 8 ohm, out 5, jumper 3-4  
 4 ohm, out 3, jumper 1-4 & 2-6

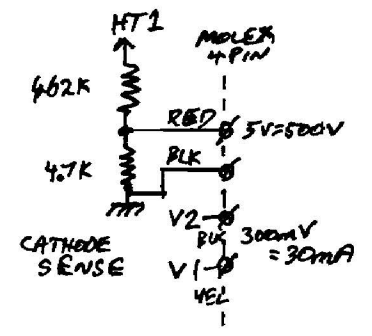
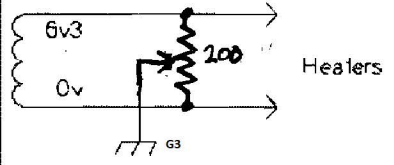
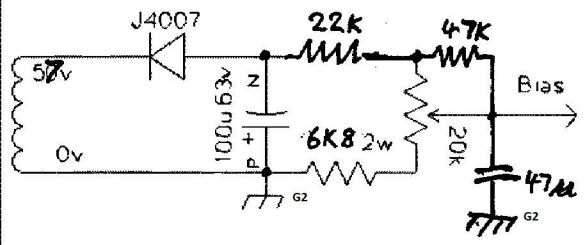
Eminar 70W: Power Amp		
Serial Number: 2999 MODIFIED		
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52481-3



23VAC WINDING NOT USED



Resistors: 1/2w, unless specified.

Eminar 70W - Power Supply		
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