

Manual

Tube Guitar Amplifier A15Mk2



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Preface

Congratulations, you've chosen the A15Mk2. Including the revolutionary VINT-AGE circuit and the especially selected Tubes from english Secret Service audio equipment...

This is what you read in a lot of manuals of Boutique Voodoo Amplifiers of today. All this you won't find in the A15Mk2, but a solid, flexible 15W amplifier (actually near 20W, who's using really clean sounds only :-) based on proven circuits of yesterday and today. When you will check the schematic, you will recognize some parts of a Fender Brownface and american high-gain amps. But you also will see, that the A15Mk2 is not a copy of these amps. A flexible two channel amp with great sound from Clean to Crunch to high-gain was my main goal and has been reached, tested with a couple of guitars and speakers – and the feedback and ideas of A15Mk1 users.

Before we start, let's just talk for a minute about your personal safety. Tube circuits are working with high voltages of up to 300V in this circuit, these may be deadly. So be careful, when measuring, and take care of all security advices in this manual, it's worth the time !

This manual contains a brief overview of all features and connections plus (the main part) a detailed description, how to build the amp. You will find an overview of all documents in the file „readme.txt“. If you have any questions, please use the Forum or send an E-Mail to **info@madamp.biz**.

Please notice, that regardless of all checks and tests we can't avoid each and every error in this documentation. I will not be liable for any losses or damages originating from information from this document. Please send me a note, if you find any error.

OK, let's come back to what you will have definitely:

Have lots of fun while building the Kit and discover the sound !



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1 Overview

1.1 Description

The A15Mk2 is a two-channel Guitar Tube Amplifier with a 15W Push-Pull Power-Stage, using two 6V6 and an ECC83 (12AX7) in the phase inverter (PI). The Preamplifier is using three ECC83's, one Triode is used for the first channel (Clean/Crunch), the other two for the second one (High-Gain).



The controls on the front panel are providing the following functions:

Fat Switch	Enhanced Bass, great for Single-Coils or solo-playing
Bass	Bass Control for Channel 1
Treble	Treble Control for Channel 1
Volume	Volume for Channel 1
Ch1/Ch2 Switch	Switch to select Channel 1 or Channel 2
Gain	Preamp Volume Control for Channel 2
Boost Switch	Switch for the additional boost stag in Channel 2
Bass	Bass Control for Channel 2
Mid	Mid Control for Channel 2
Treble	Treble Control for Channel 2
Volume	Volume for Channel 2
Standby Switch	Switch for the plate voltage
Power Switch	Main power switch



The controls on the rear panel are providing the following functions:

Power In	Power Plug Socket
Fuse 1	Main Fuse (0,5A slow blow)
Fuse 2	Plate Fuse (0,2A slow blow)
Footswitch	Connector for a footswitch (optional)
Smooth Switch	Switch for power stage filter (2 levels)
Return	Connector for Return (power stage input)
Send	Connector for Send (pre amp output)
Speaker 4 Ohm	Connector for a 4 Ohm speaker
Speaker 8 Ohm	Connector for an 8 Ohm speaker
Speaker 16 Ohm	Connector for a 16 Ohm speaker

Please take care, that only one speaker connector has to be used at a time and the amp is never used without any connected speaker. When used without a load, tube amplifiers will blow the output transformer pretty soon, so the A15Mk2 has a 680 Ohm / 5W resistor in parallel to the speaker output, this will protect the Output transformer in this case (for a short time).

This manual describes the assembly of the A15Mk2 Deluxe with the ready drilled and printed steel chassis. When you build the standard version with the undrilled aluminium chassis you need to drill this according to the drilling plan. All other steps as described in this document are the same.

1.2 Bill of Material

The following parts are provided with the kit:

Schematic Part#	Value	Type	Quantity
R51,R52	1R/2W	MF 5%	2
R60,R61	100R/2W	MF 5%	2
R59	100R/5W	high power 5%	1
R49,R50	470R/2W	MF 5%	2
R42	680R/2W	MF 5%	1
R57	680R/5W	high power 5%	1
R55,R56	1K/2W	MF 5%	2
R4,R7,R20,R32,R44	1K5/2W	MF 5%	5
R62	2K7/2W	MF 5%	1
R36,R48	3K9/2W	MF 5%	2
R10,R29,R63	5K6/2W	MF 5%	3
R43	6K8/2W	MF 5%	1
R6,R54	10K/2W	MF 5%	2
R53	18K/2W	MF 5%	1
R2,R25	33K/2W	MF 5%	2
R27	39K/2W	MF 5%	1
R9,R34	47K/2W	MF 5%	2
R8,R47,R65	56K/2W	MF 5%	3
R26	68K/2W	MF 5%	1
R38	82K/2W	MF 5%	1
R14,R21,R39,R58	100K/2W	MF 5%	4
R3	120K/2W	MF 5%	1
R5, R23,R30,R33,R45,R46,R64	220K/2W	MF 5%	7
R11,R15,R16,R19,R22,R28,R31,R35	470K/2W	MF 5%	8
R18	680K/2W	MF 5%	1
R1,R12,R13,R24,R37,R40,R41	1M/2W	MF 5%	7
R17	2M2/0,25W	MF 5%	1
C4	330pF/250V	MKP 5%	1
C18	470pF/250V	MKP 5%	1
C12	1nF/250V	MKP 5%	1
C11	2,2nF/250V	MKP 5%	1
C5	4,7nF/250V	MKP 5%	1
C1,C23,C24,C27	10nF/400V	MKP 5%	4
C7,C13,C15,C19,C20,C21	22nF/400V	MKP 5%	6
C9,C22	47nF/250V	MKP 5%	2
C25	100nF/250V	MKP 5%	1
C32	100nF/275V AC	MKTX 20%	1
C2,C14,C16	1uF/100V	MKP 5%	3
C33	22uF/63V	Elko 20% axial	1
C3,C6,C30,C31	47uF/63V	Elko 20% axial	4
C8,C10,C17,C26	47uF/350V	Elko 20% radial	4
C28,C29	100uF/350V	Elko 20% radial	2

BR1	B500C1500	Bridge Rectifier	1
D1	1N4007	Diode	1
SW1,SW2,SW3	DPDT	Miniature	3
SW4	DPDT Center OFF	Miniature	1
SW5	SPST	H8600VBAAA	1
SW6	DPST (red lamp)	H8653VBNAC	1
TR1 (incl. assembly parts)	PT 230V	Jan TRA200	1
TR2	OT 10-15W	Jan ATRA0427	1
VR9	10K lin	0,25W 6mm	1
VR7	22K lin	0,25W 6mm	1
VR2,VR5	220K lin	0,25W 6mm	2
VR1	220K log	0,25W 6mm	1
VR3	470K log	0,25W 6mm	1
VR4,VR6,VR8	1M log	0,25W 6mm	3
V1,V2,V3,V4		ECC83	4
V5,V6		6V6	2
Tube Socket		noval, ceramic	4
Tube Socket		oktal, ceramic	2
F1	0,5A slow blow	5x20mm	2
F2	0,2A slow blow	5x20mm	2
Fuse Holder		screwable	2
J1,J2,J3,J4,J5,J6	6,3mm plug socket	(isolated/switched)	5
J7	250V/5A	power plug socket	1
Power Cord		1,8m / plug and joint	1

Chassis	Aluminium	H1444-30	1
Solder lug boards		Mainboard	27 pin
		Powerboard	13 pin
Terminal Strip 2 lugs		Keystone	1
Terminal Strip 4 lugs		Keystone	1
Wire		yellow	3m
		blue	2,5m
		white	4m
		red	3m
		black	1m
		grey shielded	1,5m
		green	2,5m
		green (thick)	0,3m
		Green-yellow	5cm
Shrink Tube		4,8=>2,4mm	10cm
		3,2=>1,6mm	40cm
Isolated wire holes	Rubber, 6mm hole	KDF8	3
Nuts and bolts	M4x10	Screw	6
	M3x8	Screw	21
	M3x8	Distance bolt	5
	M4	Nut	6
	M3	Nut	22
	M4	Washer	6
	M3	Washer	5
	M4	Lock washer	6
	M3	Lock washer	28
	Solder lugs	Silver plated	5

1.3 Documentation overview

The following documents are supplied with the kit:

- a) This Manual
- b) The schematic and the layout (Parts layout)
- c) Drilling Plan (not needed for the "Deluxe" version)

All documents are supplied in electronic form.

1.4 Tools needed

For building the kit you will need the following tools. For every tool needed you will find additional (but not necessary) tools to simplify your work. Topics e) and f) are irrelevant for the "Deluxe" version.

- a) Multimeter (Voltage/Current/Resistance)
optional: signal generator, oscilloscope, secondary multimeter, capacitance meter
- b) Soldering iron and solder
optional: desoldering iron
- c) Flat nose and wire cutting pliers
optional: stripper
- d) screwdriver for slotted grub screws / screwdriver for slotted head screws
optional: bench vice
- e) Drilling machine with drills for metal 3/4/6/10/12/13/25 mm
optional: drill bit for sheet metal or subland twist drill
- f) Round file and flat file
optional: three-edged wedge
- g) Socket or combination wrench, different sizes
- h) Lighter for fireplace/grill (lighter with long nozzle)
optional: heat gun for shrinking tube
- i) Folding rule and ruler
optional: slide gauge
- j) Glue (for glueing some wires)
- k) A cheap 8 Ohm Speaker >25W for testing purposes
optional: Power Resistor 8 Ohm >25w

1.5 Security Advice

Please be aware, that Tube Amplifiers are using high Voltages, so never touch a solder lug, wire or any other conductive parts inside the amp while switched on or connected to the wall outlet. Though most of the lugs at the Power-Transformer and Output-Transformer the amp shall be covered with shrink tube, some conductive parts are still uncovered, those high voltages are dangerous !

So the old guiding principle „never use both hands, when measuring high voltage“ is still valid, especially when you're wearing isolating shoes (soles). In the case of touching a part with high voltages, the current won't flow through your heart then, which is the most dangerous issue with high voltages.

Derived from these facts you should neither experiment with the earth connection of your amp, nor doing some „quick changes“ to your amp layout, when connected to the wall outlet. For measuring voltages and current always use isolated spikes, allowed for at least 500V by the vendor.

When turned off and disconnected from the wall outlet, all voltages will drop down to or near zero in one to two minutes. Last but not least please be aware, that the tubes are pretty hot and should cool down before touching or removing them.

A last word about the fuse: There is always a reason for a burned out fuse, most of the time the layout is incorrect, in some rare cases one of the parts (e.g. an electrolytic capacitor) is defective. Never replace a fuse with a bigger one (regarding max. current), always check the layout and the parts first and then replace the fuse with the same value.

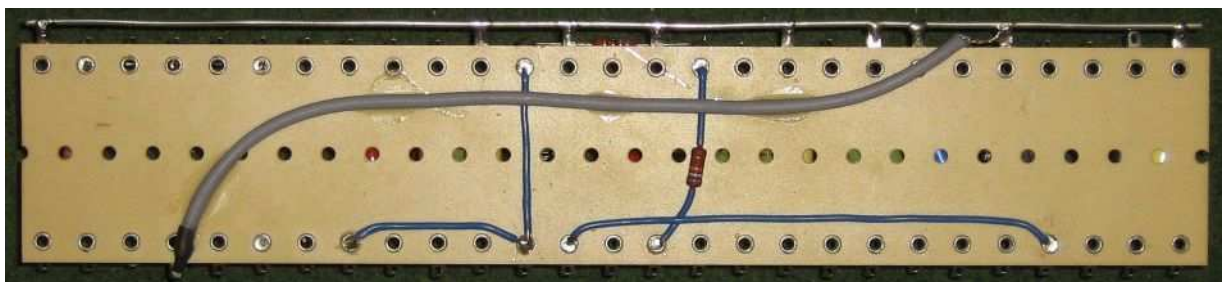


2 Building the Amplifier

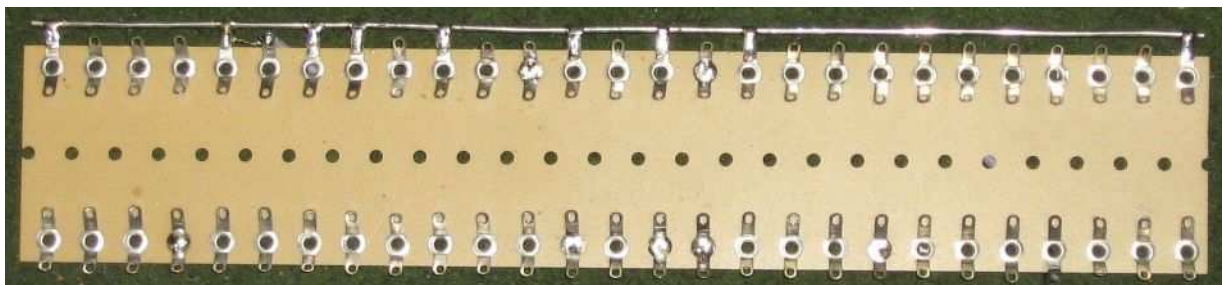
In this chapter you will find a comprehensive description on how to assemble the amplifier. For a picture of the assembled amp please see the last section of this chapter.

2.1 Bestücken der Hauptplatine

Before assembling the main board, please solder the bus ground wire (thick green wire without isolation) to all lugs connected to ground, as shown in the layout plan. Please take care, that all soldering is done 100% to prevent grounding problems. Next do the wiring at the back of the board, place the connections with blue wire, the shielded connection (connected to ground on one side only) and the resistor R25. To prevent the shielded wire from moving you can glue it to the board.



Now prepare the parts, place them on the board, prepare the connecting wires and do the soldering. For connecting the parts to each other (as documented in the layout plan) you can use the connecting wire.



After cutting the connecting wires you should check the soldering again to prevent bad connections (this problem is hard to find later, so please solder again, if there are some „suspicious“ lugs). It's no waste of time too, if you check the parts with your multimeter, this will also prevent you from mixing up the parts.

Please leave some space for the screws, where needed, you may bend away the parts to get some space.

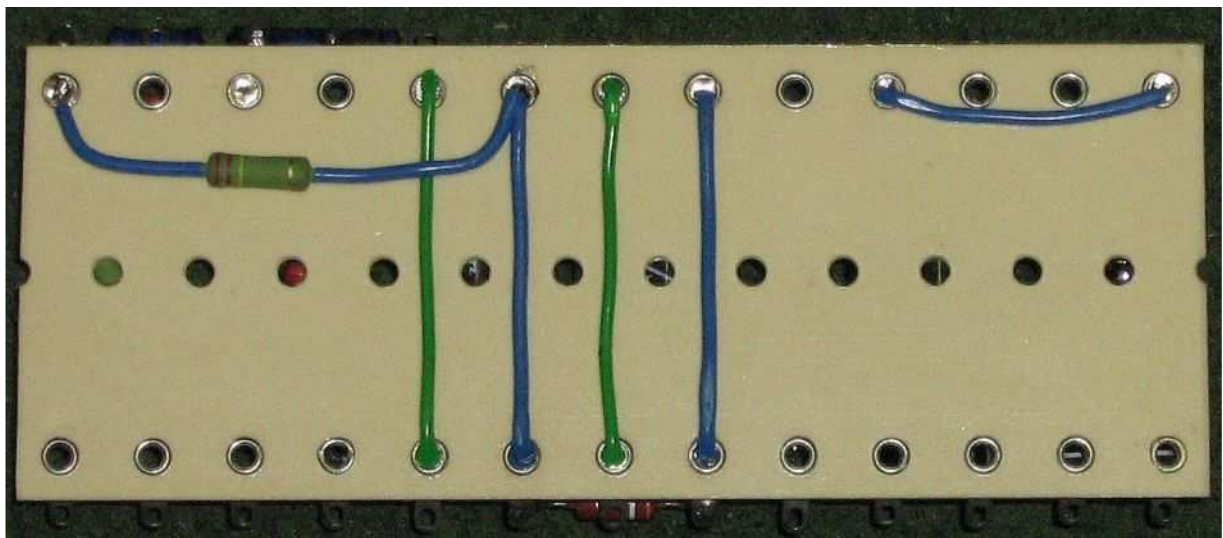
The fully assembled main board should look like this:



2.2 Assembling the Power Supply Board

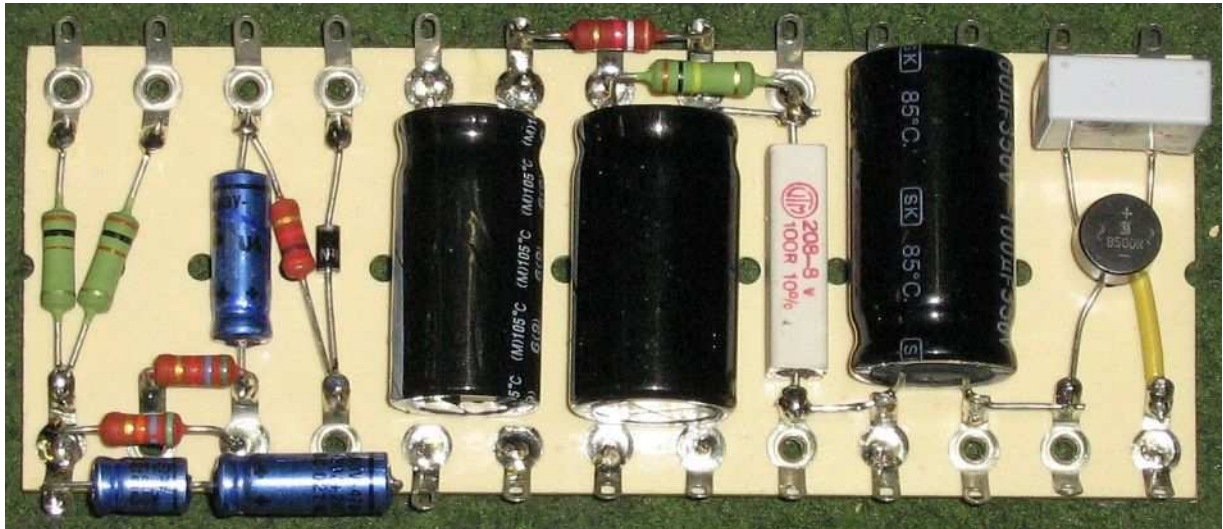
Assembling the board is mostly the same as with the large board, additionally please do the following:

The PLUS connecting wire of the bridge rectifier needs to be isolated to prevent contact with other connection wires of this device. You can use some of the isolation of the yellow wire for this purpose.



At the back of the power supply board you need to connect the lugs with blue and green wire and assemble R64 as shown above.

When completely assembled, the board should look like this:



2.3 Assembling the Chassis

First of all please install the two boards mounting first the distance bolts, screws and lock washers to the board, then assemble it to the chassis (sequence from the top: screw, lock washer, sheet metal, washer, distance bolt, board, lock washer, nut) . Next please install all tube sockets, the bias control and the two terminal strips as documented in the layout plan and the following picture.

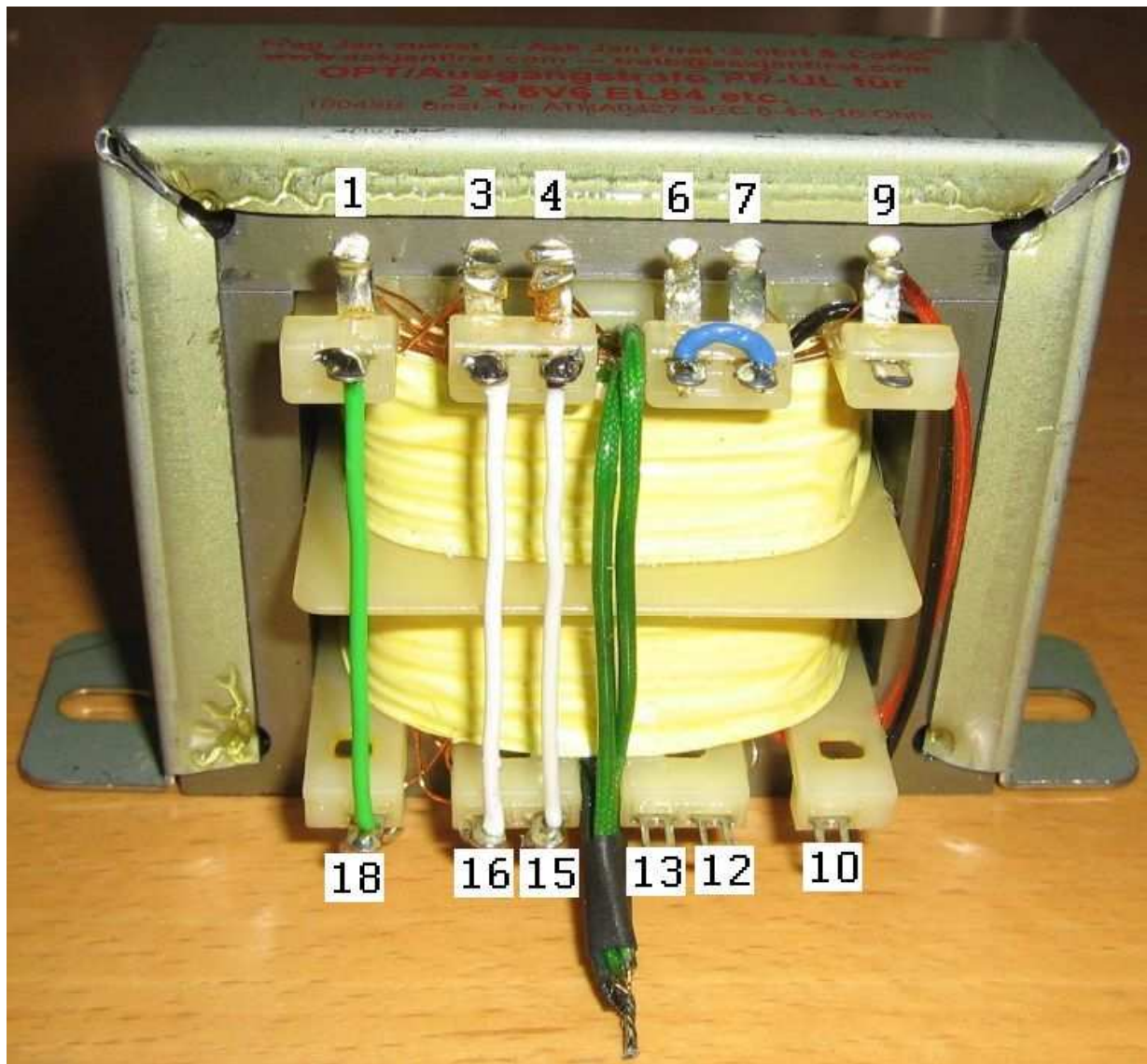


Then the rear panel needs to be assembled. Please install the plug socket for the power cord , the two fuse holders (plastic, be careful when screwing and first cut off

the small plastic tappet from the bottom of the thread to make it fit with the front panel), the connectors for the FX-Loop (Send/Return) and the three speaker outlets.

Next please do the wiring of the Output Transformer like this:

- a) green wire from pin 1 to pin 18 (signal ground)
- b) white wire from pin 3 to pin 16 (4 Ohm)
- c) white wire from pin 4 to pin 15 (8 Ohm)
- d) solder all four long wires together and fix them together with some shrinking tube (16 Ohm)
- e) connect pin 6 and 7 (plate voltage input) with some blue wire



Then please install the power transformer and the output transformer using the M4 screws with washers, lock washers and nuts. The power transformer needs to be installed like illustrated above (the solder lugs are near the grommets), at the output transformer lugs also need to face the grommet. Finally please check, that the metal parts of the power transformer and output transformer are connected electrically with the chassis (0 Ohm between all metal parts). Where needed, please remove the painting from the parts.

2.4 Wiring the Power Supply Board

2.4.1 Primary

First of all please install the solder lug for connecting the chassis to earth (green/yellow wire of a power cord), see picture. Please remove the painting from the chassis at the hole to ensure proper grounding of the chassis (sequence for assembly from the top: screw, lock washer, sheet metal, washer, nut, solder lug, lock washer, nut). Then connect this lug to the center tap of the plug socket, using the green/yellow wire provided with the kit (before soldering, insert the power cable to stabilize the pins of the plug socket). Please check this connection carefully with your multimeter as well as mechanically.

This connection is your life insurance, when, by some circumstances, high voltage is applied to your chassis!

Then install the main grounding point (star ground), it needs 4 lugs to be installed, all voltages are measured in reference to this point (if not, it will be mentioned respectively). Please remove also the painting from the chassis at this hole to ensure proper grounding. All ground connections illustrated in the layout plan have to be wired individually to the star-ground point as shown in the plan.



Before assembling the yellow wires please connect the power cord and check with your multimeter, that it will show 0 Ohm between chassis and earth (I always measure against earth in the wall outlet to be absolutely sure) and 0 Ohm between the star ground lug and earth. Please disconnect the power cord before going on wiring the power supply!

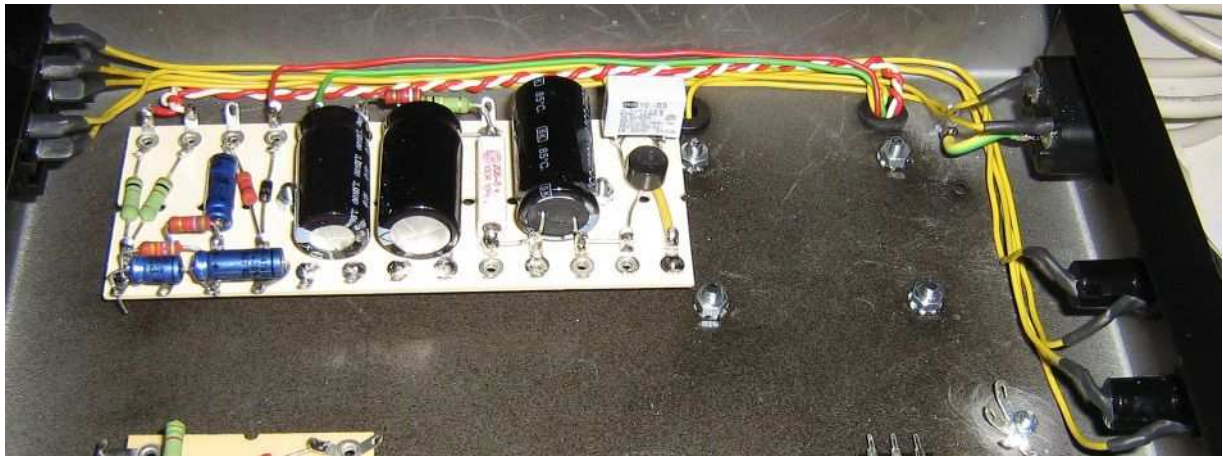
Then connect the plug socket (before soldering, insert the power cable to stabilize the pins of the plug socket), the power switch, the fuse holder (insert a fuse before soldering) and the primary side of the power transformer (lugs 3-7) using the yellow wire as documented in the layout plan. Please use some shrinking tube to isolate the lugs and taps at the switch, the fuse holder, the plug socket and the transformer. For shrinking the tube you may use a lighter with a long nozzle (as used for lighting fires), but heat up the shrinking tube only for a very short moment to prevent it from melting. When wiring is finished, please check, that everything is correct, insert the main fuse (0,5A slow blow), connect the power cord and switch on the amp.

Now these voltages (+/- 5% optimum, +/- 10% are tolerable) are to be measured at the taps of the power transformer:

- a) Primary
Pins 3-7 230V
- b) Secondary
Pins 10-12 265V
Pins 13-15 24V
Pins 16-18 7,4V

2.4.2 Secondary

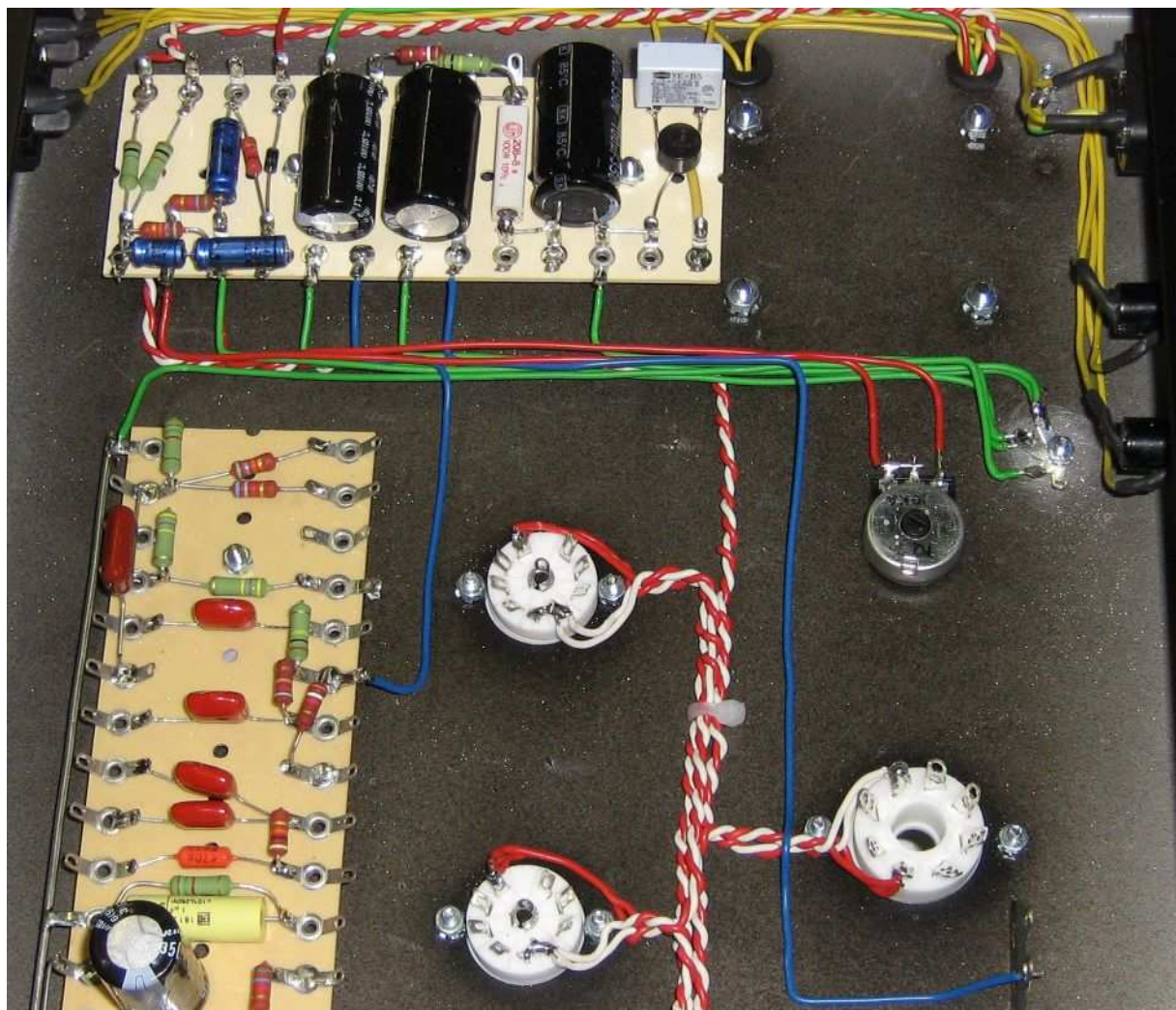
Please connect now the secondary side of the power transformer, the standby switch and the rectifier using the yellow wire as documented in the layout plan. Isolate the soldered connections at the transformer and the switch with shrinking tube. Now connect the heater voltage (6,3V) from the transformer to the power supply board using the red and white twisted wire as well as the bias voltage (24V) with the red and green wire, this connections don't need to be isolated at the transformer.



Now do the heater wiring for all six tube sockets (starting with V6, then V5, V4, V3, V2 and V1, all in parallel), using the red and white twisted wire. Please take care, that these wires are not placed directly beneath a tube socket and not in parallel with other wires (this prevents hum as well as twisting the wire). Please attach the wires to the chassis with some glue and to each other with a binder, when you're sure it's wired correctly.



Now do all ground connections of the power supply to the star ground using green wire (see layout plan), please use one lug at the star ground for two green wires. Next do the wiring for the plate voltage (blue wires) from the power supply to the main board and to the terminal strip between the power tubes. Last connect the power supply to the bias control using red wires and connect pin 2 and 3 of the bias control (variable resistor).



When wiring is finished, please check, that everything is correct, insert the fuses, connect the power cord and switch on the amp (without tubes for 1-2 minutes only, because the voltage without tubes is >350V). Now these voltages (+/- 5% optimum, +/-10% are OK) are to be measured at the power supply board:

- | | |
|--|----------------------------------|
| a) At the rectifier (+) | 355V |
| b) Output of the power-supply board => C26 (+) | 355V |
| c) Output if the bias control (pin 2/3) | -21V to -27V (variable resistor) |
| d) Heater voltage (red against white wire) | 7,4V |

Last but not least check the heater voltage at all five tube sockets, it should be 7,4V too (equal to the voltage measured at the power supply board).

After switching off the amp please check, if the voltage at the output of the power supply board (e.g. + of C28) is going down pretty quick, this is what R58 is for. Having checked that, please disconnect the power cord again.

2.5 Wiring the Main Board

2.5.1 Output

First of all connect the primary side of the output transformer with blue wire:

- a) pin 12 to pin3 of tube V5
- b) pin 13 to pin 3 of tube V6
- c) pins 6/7 to R55/R56



Then connect the secondary side of the output transformer to the output plug sockets (speaker outlet) with green and white wire and assemble the security resistor R57 (this resistor prevents the output transformer from damage, when no speaker is connected). Please connect all ground connectors of the three output plug sockets with a wire (see picture), then assemble R57 and connect the output transformer:

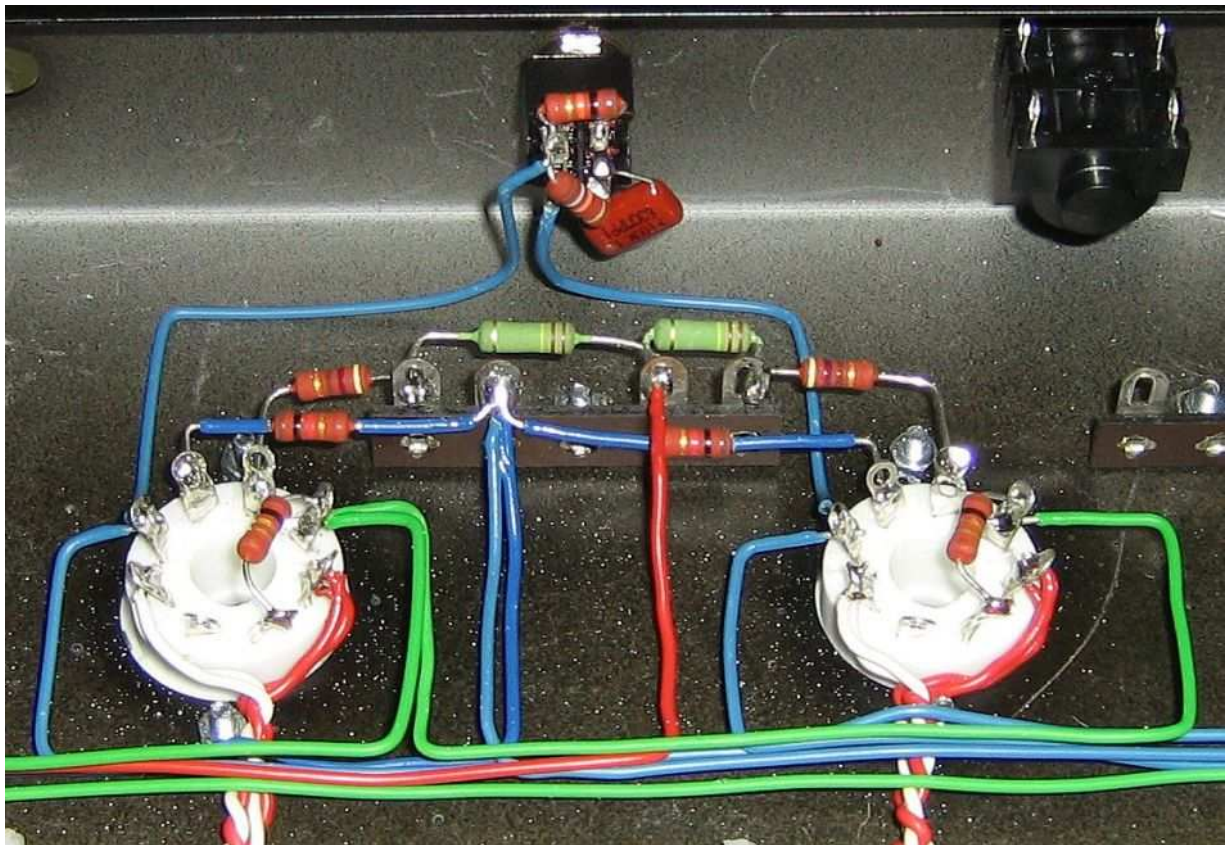
- a) pins 1/18 = ground (green)
- b) pins 3/16 = 4 Ohm (white)
- c) pins 4/15 = 8 Ohm (white)
- d) the four long wires = 16 Ohm (white)

At last please connect the output plug sockets to the star ground point. Please check the resistance of the output transformer after assembling the parts to make sure everything is wired correctly. At the primary side you should measure about 500 Ohm, at the secondary side you should measure about 1Ohm at the 4 Ohm, about 1,2 Ohm at the 8 Ohm and about 1,4 Ohm at the 16 Ohm connector.

2.5.2 Power Tubes V5/V6

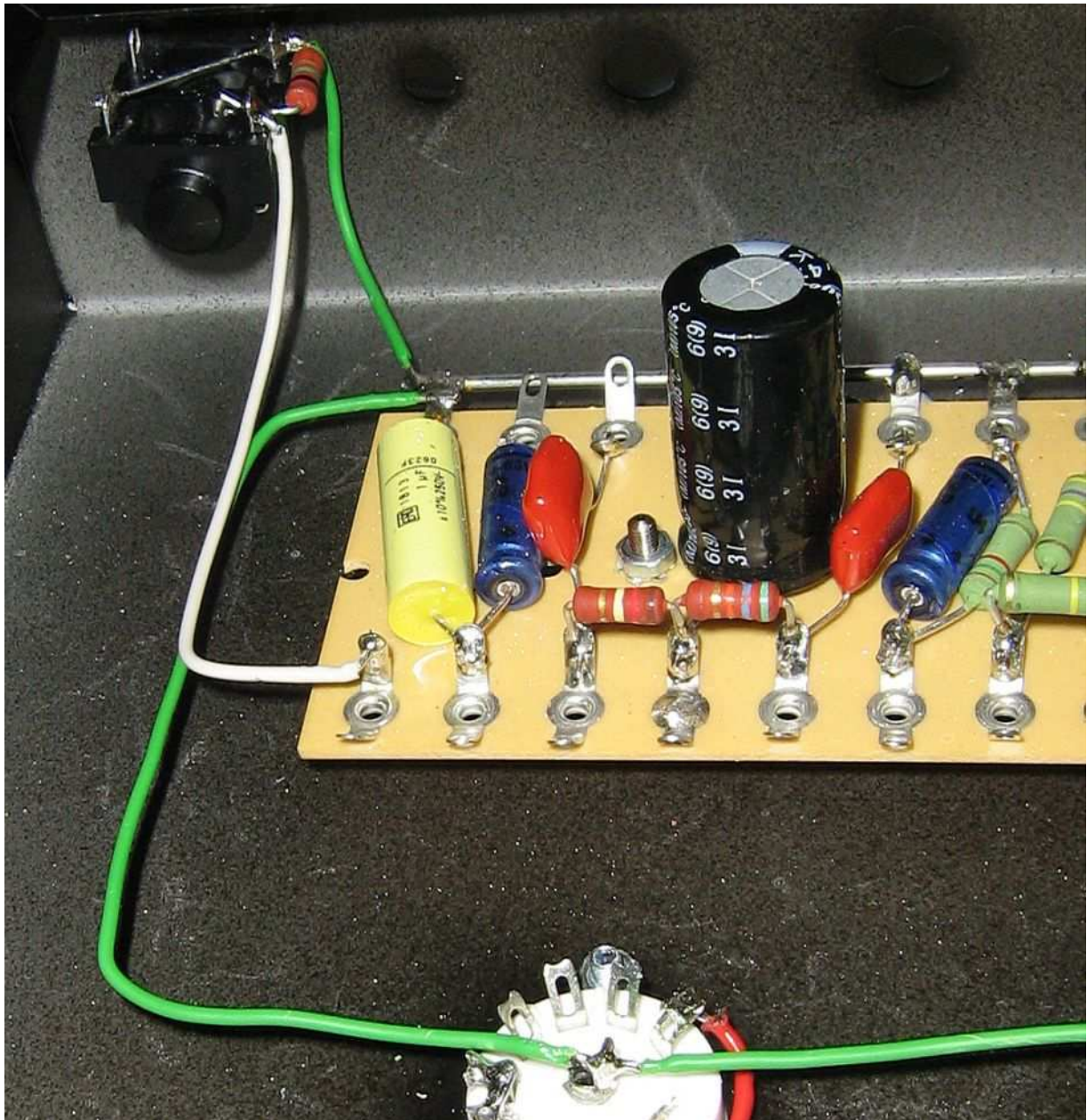
First place the screen resistors R55 (lower hole of the solder lug at the tube socket) and R56 (upper hole), then the grid resistors R49 (upper hole) and R50 (lower hole) and last the bias resistors R45/R46. These six resistors are soldered to the terminal strip and between the terminal strip and the tube sockets respectively. To prevent shorts please isolate the wires where necessary.

Then connect the bias control to the terminal strip with red wire, solder the cathode resistors R51/R52 to the tube sockets (upper holes) and connect them to the star ground. Last assemble the “smooth” switch (on/off/on switch!) as shown in the layout plan and the following picture and connect the switch to the plates (blue wires). To ease up the assembly attach it to the front panel the wrong way round and solder R54, then R53 and last C27.



2.5.3 Input

Please assemble R1 to the input plug socket and use the wire to connect the switching connector of the input plug socket. Then put it into the chassis and connect it to bus ground with green wire. Last connect it with a white wire to the solder lug on the main board.

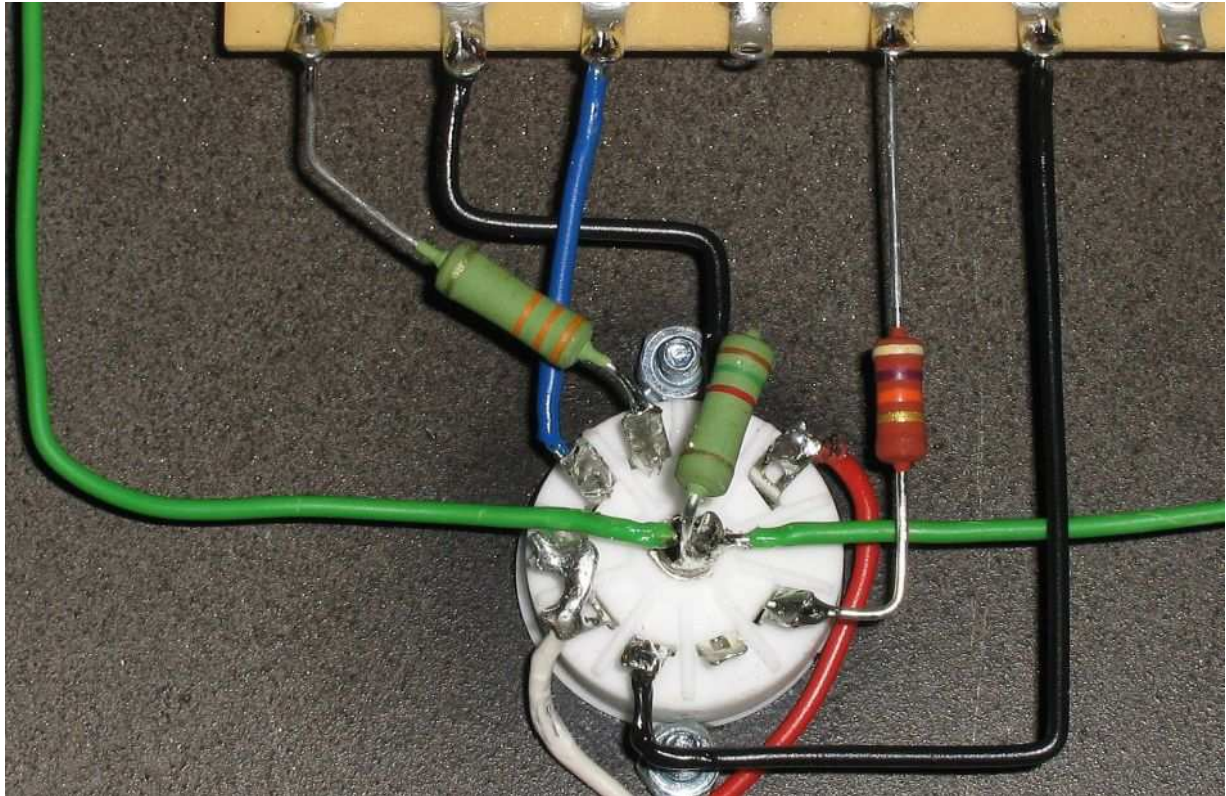


Please check next, if the input plug socket is wired correctly, without plug you should measure 0 Ohm between signal and ground, with plug you should measure 1MΩ.

Then connect the center pins of the tube sockets V1, V2 and V3 to bus ground using green wire.

2.5.4 Channel 1

First solder R4 to the tube socket V1. Then mount the other resistors and do the wiring (besides pin 2) as shown in the following picture.



Now connect pin 2 of the tube socket to the center pin of the variable resistor VR3 with white wire and wire all other controls of channel 1 from left to right as shown in the layout plan and the following picture. To ease up the assembly attach the three variable resistors to the front panel the wrong way round and wire them before putting them into the chassis (see picture). The connecting wires attached to the controls only should have a length of 3cm (green) and 6cm (white) respectively.

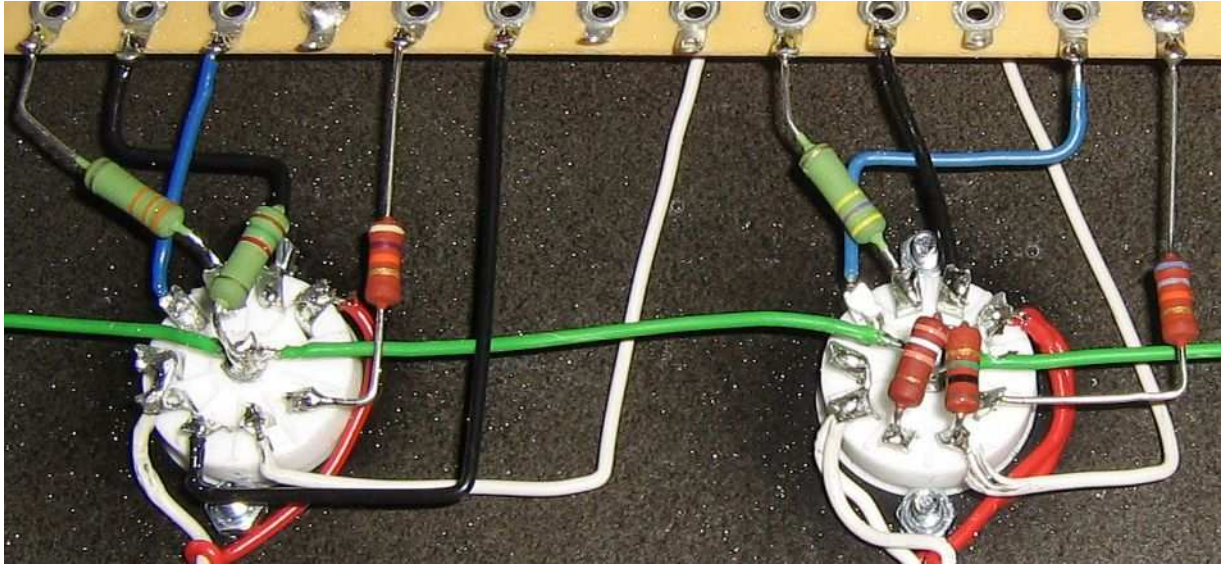


Last assemble the controls to the chassis, connect the wires and do the connections to the channel switch for channel 1 (see picture).

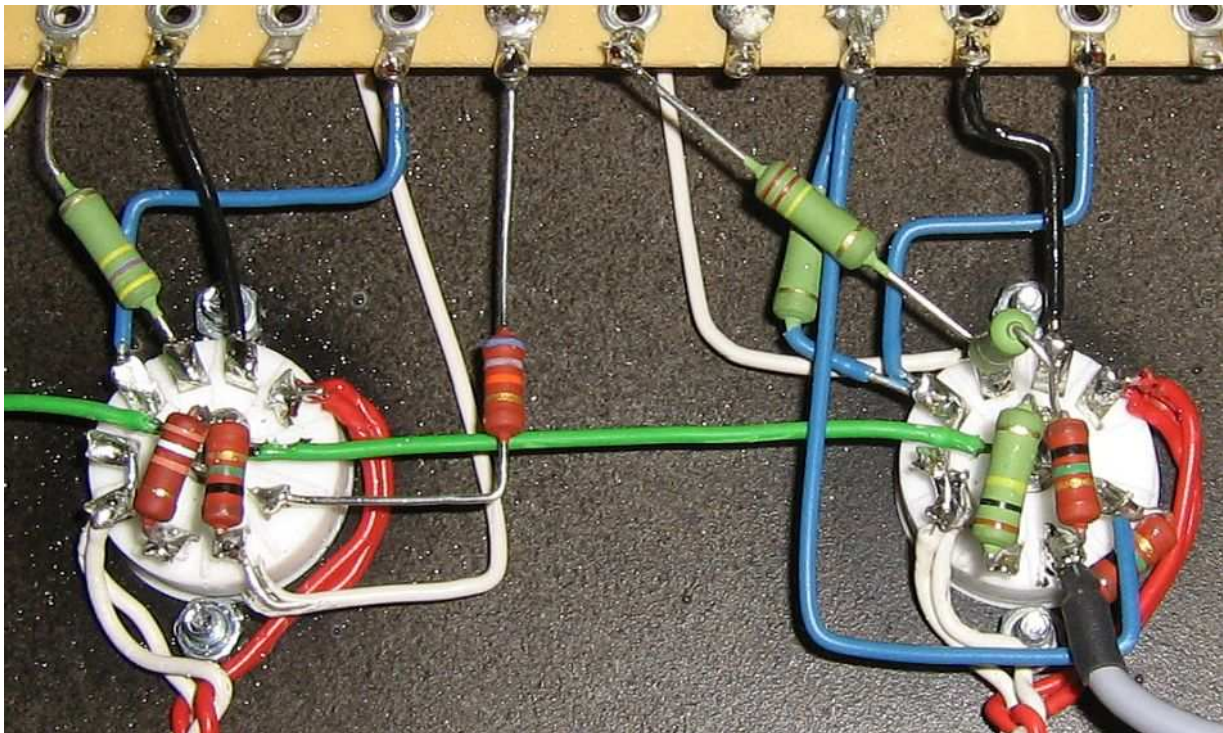


2.5.5 Channel 2 (tubes)

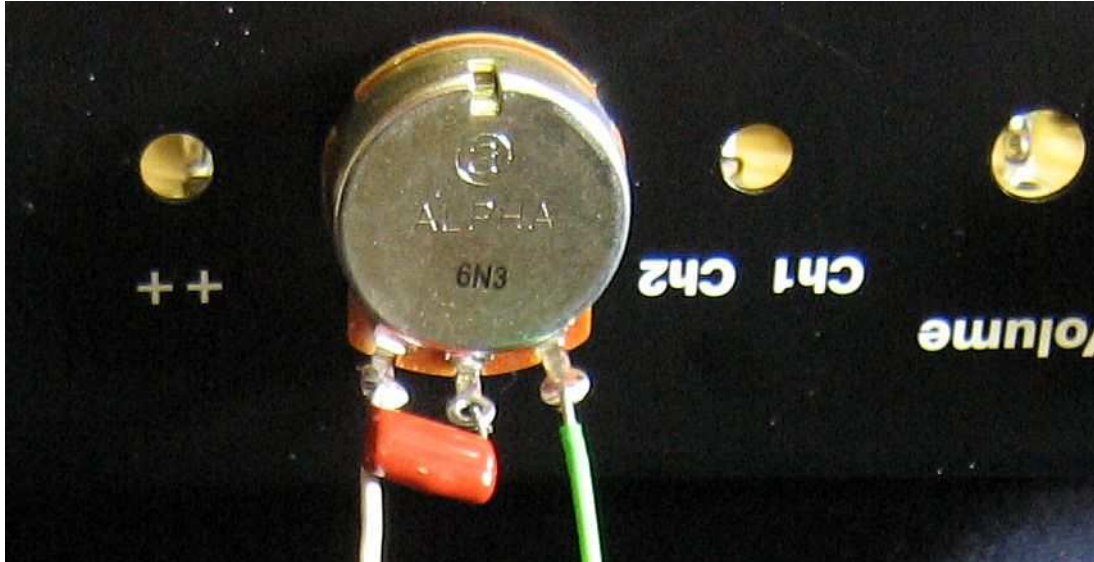
First solder the resistors R24/R27 to the tube socket V2, then wire all connections to the main board (see picture). Last connect pin 2 of the tube socket to R22 with white wire as shown in the layout plan.



Now solder the resistors R12/R13/R14/R31 to the tube socket V3 and wire all connections to the main board, please isolate the wires where needed. The connection from pin 2 to R11/F35 needs to be done with shielded wire, the shielding must be connected only to bus ground. Last connect pin 7 or the tube socket V3 to the channel switch as shown in the layout plan.



Next do the remaining wiring for the channel switch as shown in the layout plan. Then do the wiring for the gain control (VR4), to ease up the assembly attach the variable resistor to the front panel the wrong way round and wire it before putting it into the chassis (see picture). The connecting wires attached to the controls only should have a length of 3cm (green) and 6cm (white) respectively, don't solder the center lug now.

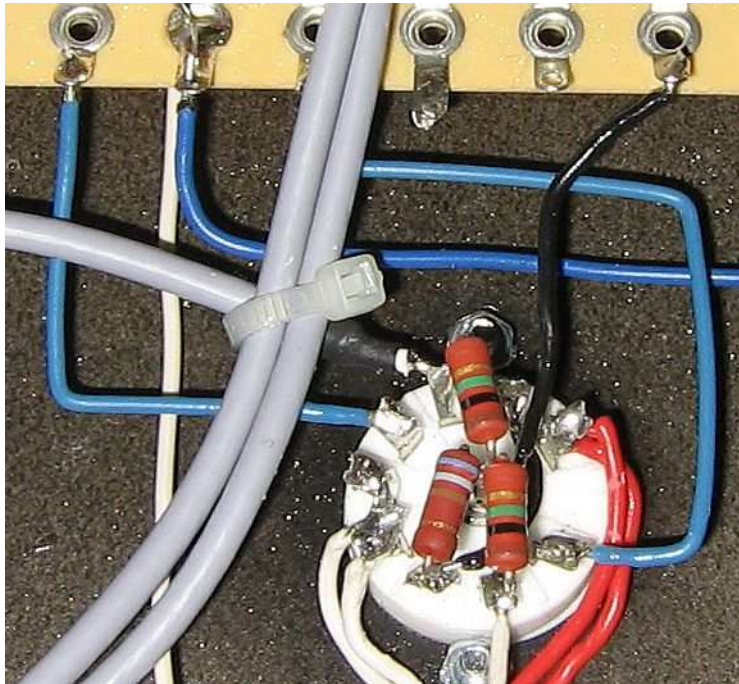


Last do the wiring for the boost switch, please isolate the wires of R23. The layout of the wires running below the main board is shown in the layout plan and in the overall picture at the end of the manual.

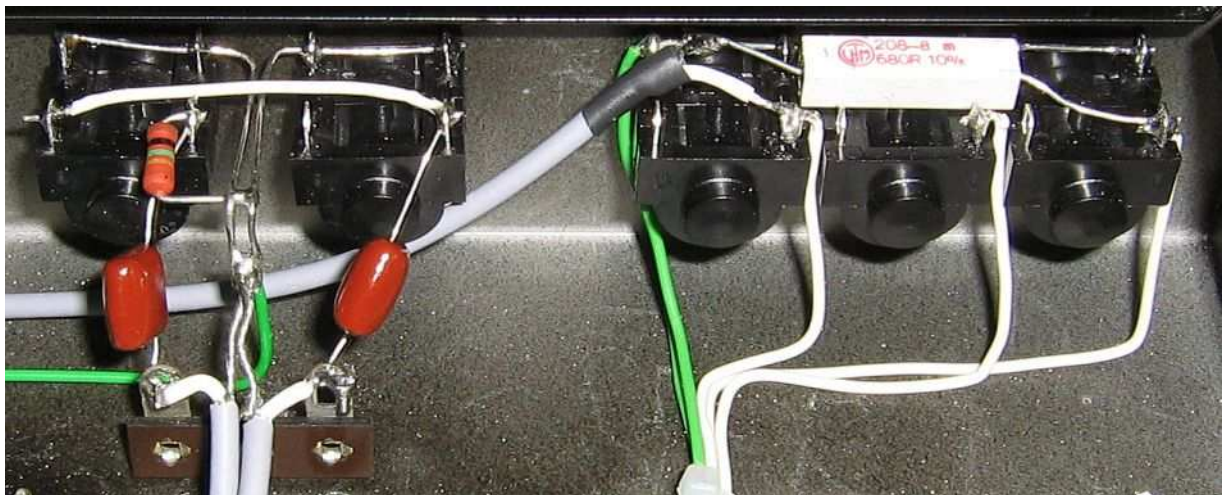


2.5.6 Phase Inverter and FX-Loop

First connect pin 3 and pin 8 of tube socket V4 with a short black wire, then solder the resistors R40/R41/R42 to the tube socket. Next do all connections to the main board and connect pin 2 and C25. Last connect R47 and the 4 ohm speaker connector with shielded wire (connection F in the layout plan), this has to be grounded at the speaker connector only (see overall picture of the chassis).

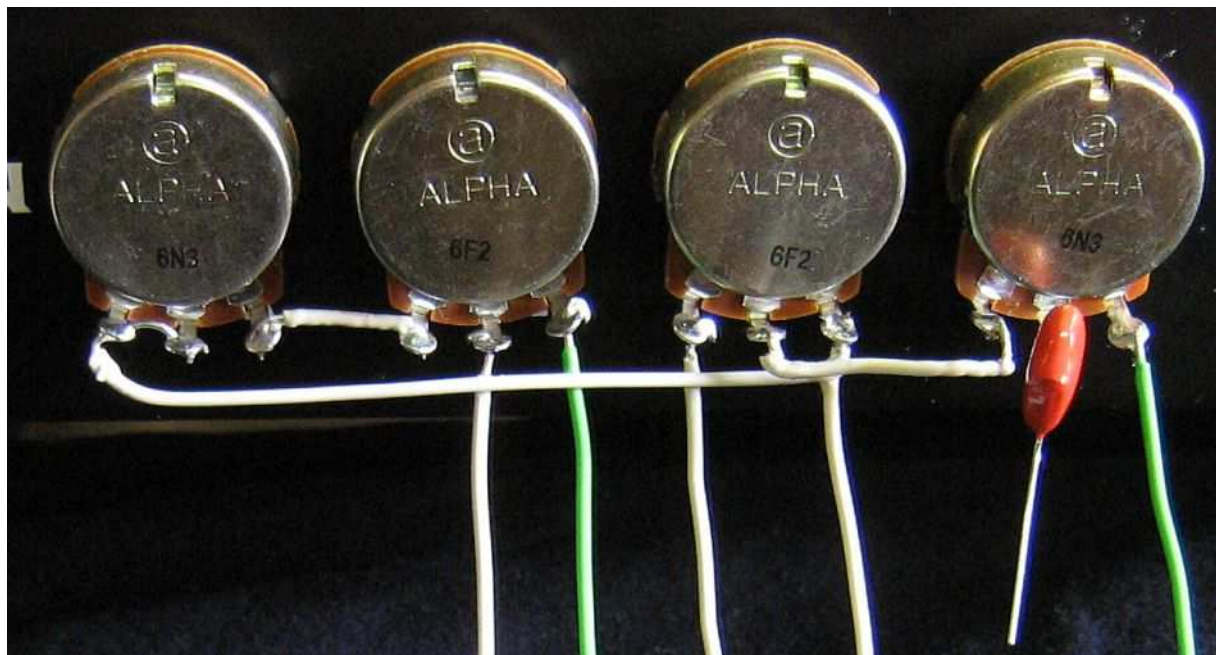


Now assemble the Send/Return (FX loop), first connect all ground connectors at the plug sockets and create a ground point with this wire (see picture). Then connect this ground point with green wire to star ground and assemble C9/C22 and R37. Now connect the two plug sockets with a white wire (switched at J2, so the connection will be opened with a jack in here). Last assemble the connections to V3/pin3 (Send, connection C) and V4/pin7 (Return, connection D) with shielded wire, the shielding needs to be connected to the ground point at the Send/Return only.



2.5.7 Channel 2 (Controls)

To ease up the assembly of the tone stack and volume control, attach the variable resistors to the front panel the wrong way round and wire them before putting them into the chassis (see picture). Then place the controls in the chassis and do all connections as shown in the layout plan and the picture. The connecting wires attached to the controls only should have a length of 4cm (short wires, e.g. the two green ones) and 8cm (long white wires) respectively.

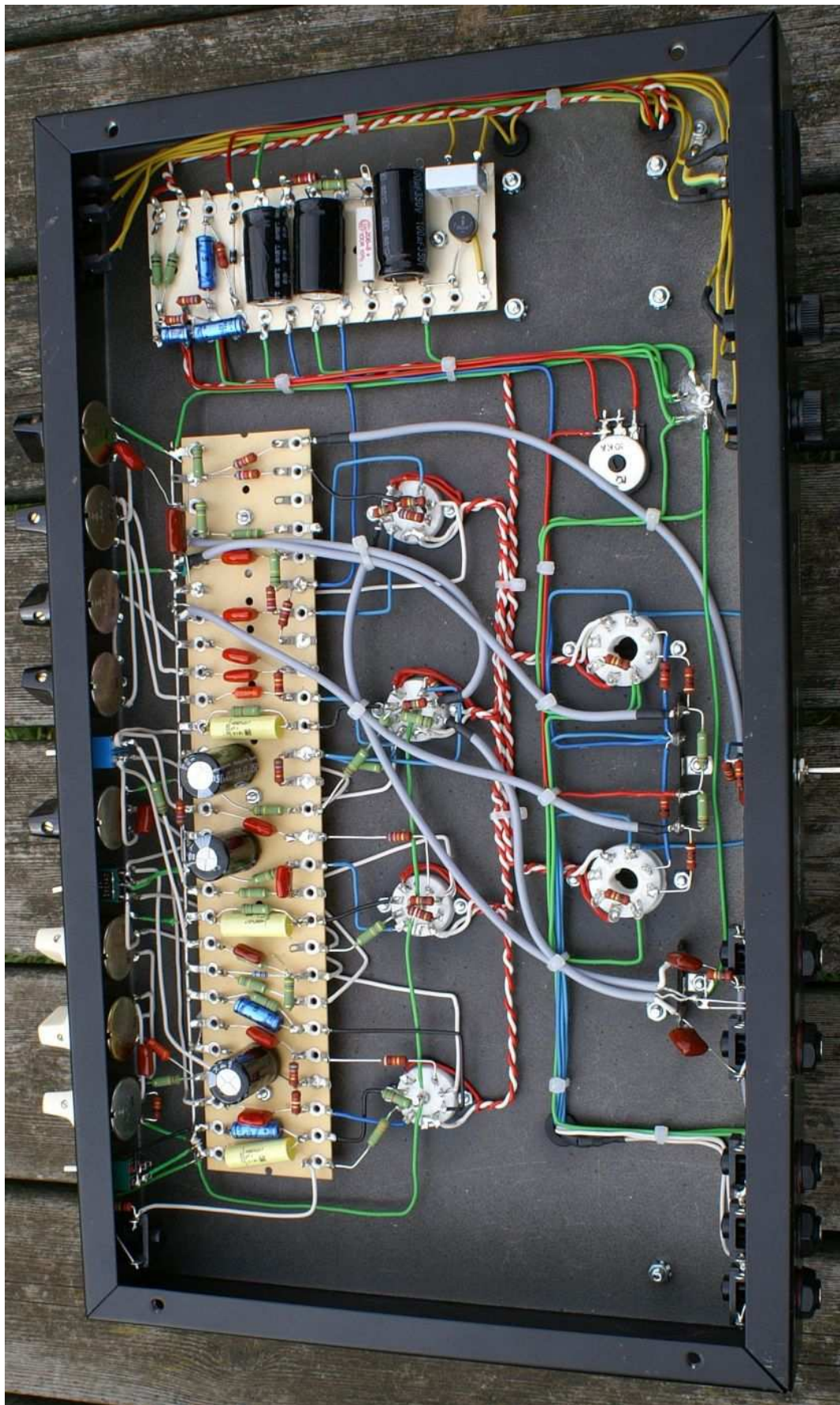


Now connect the outputs of the phase inverter with the power tubes (connections A and B), the shield is grounded at the main board (ground bus) only. Take care, the

shield needs to be isolated with shrink tube to prevent it from contacting lugs at the main board!

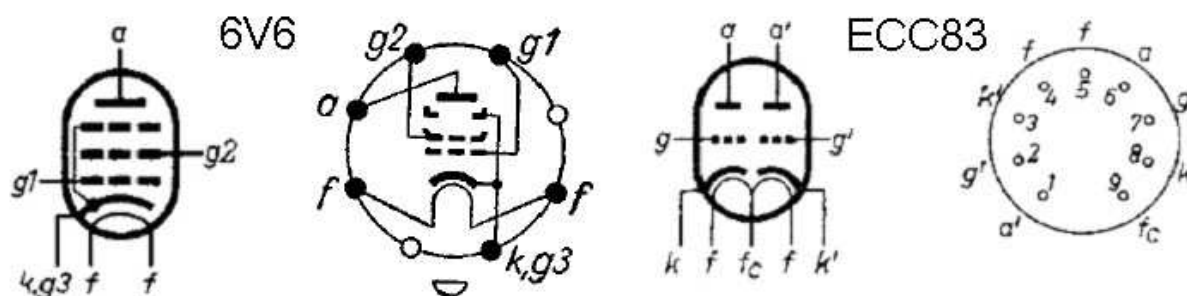
Please check and measure all connections to make sure everything is assembled correctly (signal against ground, max left/right of controls, switches etc.). Now all wiring is done, the amplifier should look like illustrated in the next picture (besides holders, these should be assembled when the amp is working fine 😊).

2.6 Chassis Overview



3 Checking and Testing

Naturally you want to switch on and try the amp now, but please do some thorough checking first! From my experience it's best to check first, that everything is wired like illustrated in the layout plan. Then please check the amp a second time by using the schematic. For checking the tube sockets please use the following pinouts (german notifiers) of the ECC83 (12AX7) and 6V6.



When you're sure, that everything is wired correctly, please turn all controls to the left, all switches to „off“ and connect the power cord. Please connect always a power resistor or a cheap speaker (8 Ohm, at least 25W) to the output plug socket, otherwise your output transformer could be damaged.

When you've switched on Power and Standby you should notice nothing like smoke, glowing parts or anything else like this!

When everything is fine, switch off the amp (you shouldn't power on the amp without tubes for more than 1-2 minutes), insert the tubes and turn on the amp (first main switch, then standby a minute later). When switched on, all heater wires must glow (just the wires in the centre of each tube, if the grey sheet metal is glowing, there's definitely something wrong). When everything is fine, please wait for a minute or two and compare then all voltages with the schematic. A deviation of +/-5% is optimal, +/-10% is OK, the heater voltage (AC) has to be between 6,1V and 6,9V. Now turn the variable resistor VR9 until the voltage at R51 and R52 is less or like 35mV. When the voltages at R61 and R52 are different, the higher one should be less or like 35mV. Please check and adjust this after 10-20 hours of usage.

If all voltages are correct, the amp is finished, and all wires shall be tied together with holders (after switching off and disconnecting the power cord, off course).

4 Options

4.1 Cabinet

Because you've had to decide at the beginning, if you want to build an amphead or a combo, that's settled already. It's up to you, how the cabinet should look or what's your favorite size to build. Please make sure at least, that the cabinet isn't too small and includes some holes to allow some air ventilation. Another must is a cabinet, that assures protection against contact for the transformers and tubes, though the latter should be accessible for replacement.

4.2 Footswitch

A footswitch option (kit) as well as a matching foot switch is available at "Musikding", the schematic is available in the madamp support board.

4.3 Mods

There's nothing more exciting then changing some parts values to get your „ultimate“ sound ☺ Naturally, that's also possible with the A15Mk2, here are some examples:

- a) Take away C14 and/or reduce resistor R33 (to 100K-150K), this will result in less gain for channel 2
- b) Reducing C12 to 470pF will result in more highs for channel 2
- c) Changing the voltage divider R8/R9 will change the amplitude of the output of channel 1, this will reduce or enhance power amp distortion (the total of R8 and R9 should be about 100K ohm)
- d) If you want a more "clean" sounding power stage, you can enhance the negative feedback in the power stage by changing the connection F from the 4 Ohm to the 8 or 16 Ohm output

Please be aware, that radical changes of parts values will lead to radical tonal changes, most of the time the sound gets worse. Sometimes it's useful to switch back to the original values to recognize, that this is already „the“ sound you've been searching for ☺