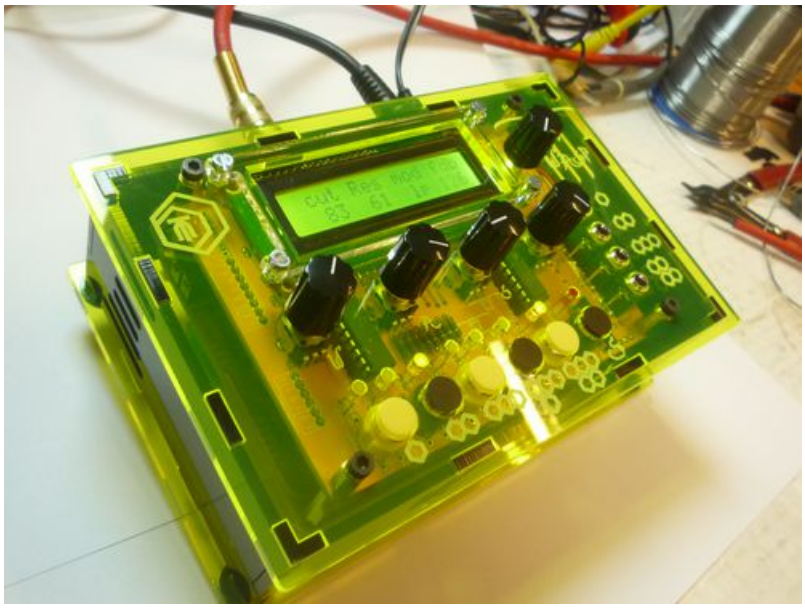
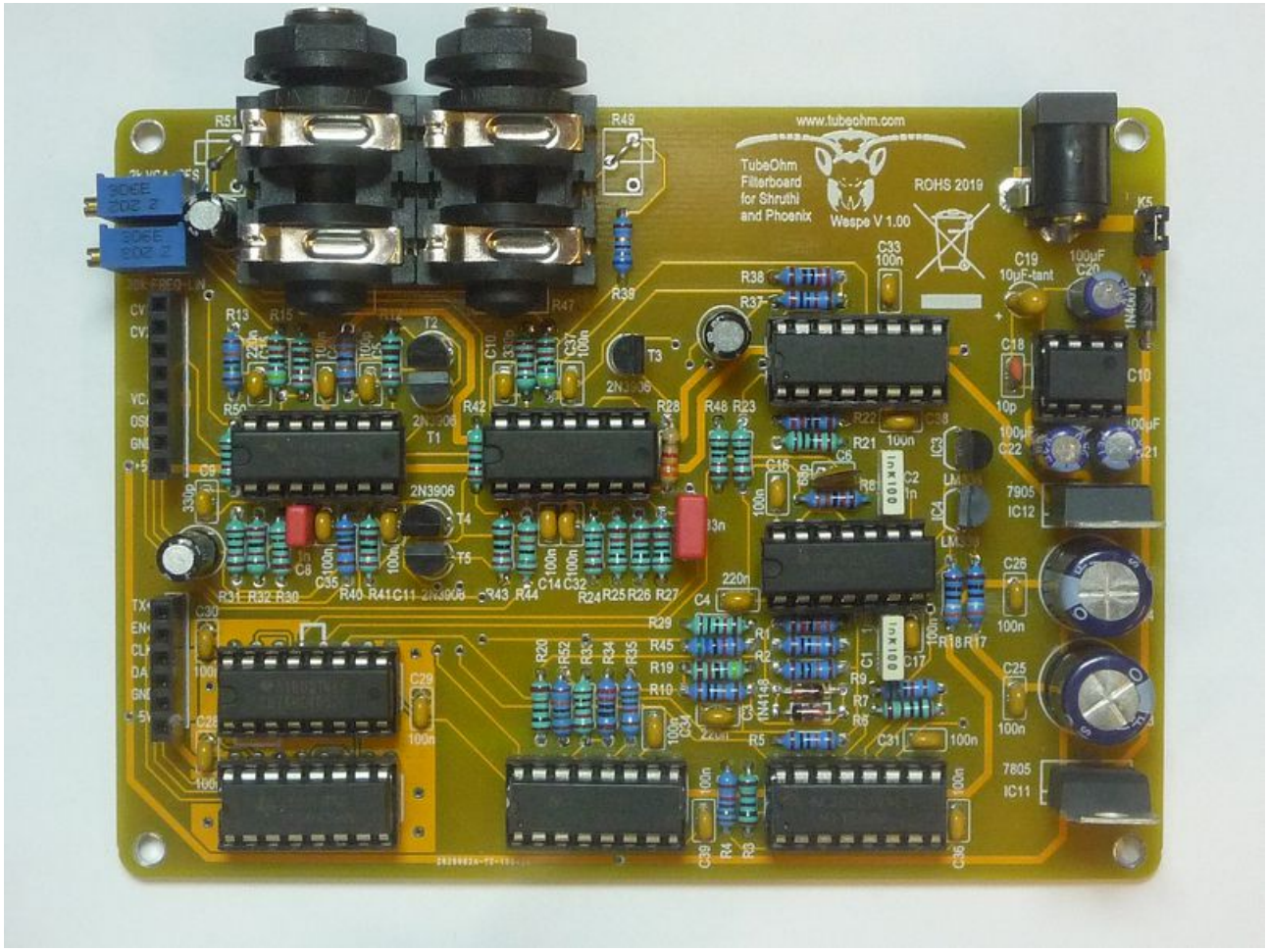
TubeOhm Phoenix/Shruthi CD4069 edition

Phoenix Wespe Filterboard
DIY manual english V 1.00
date 22.07.2019



Hello , now we come to the second part of the DIY manual. I hope you have already soldered yourselves a little warm at the motherboard.

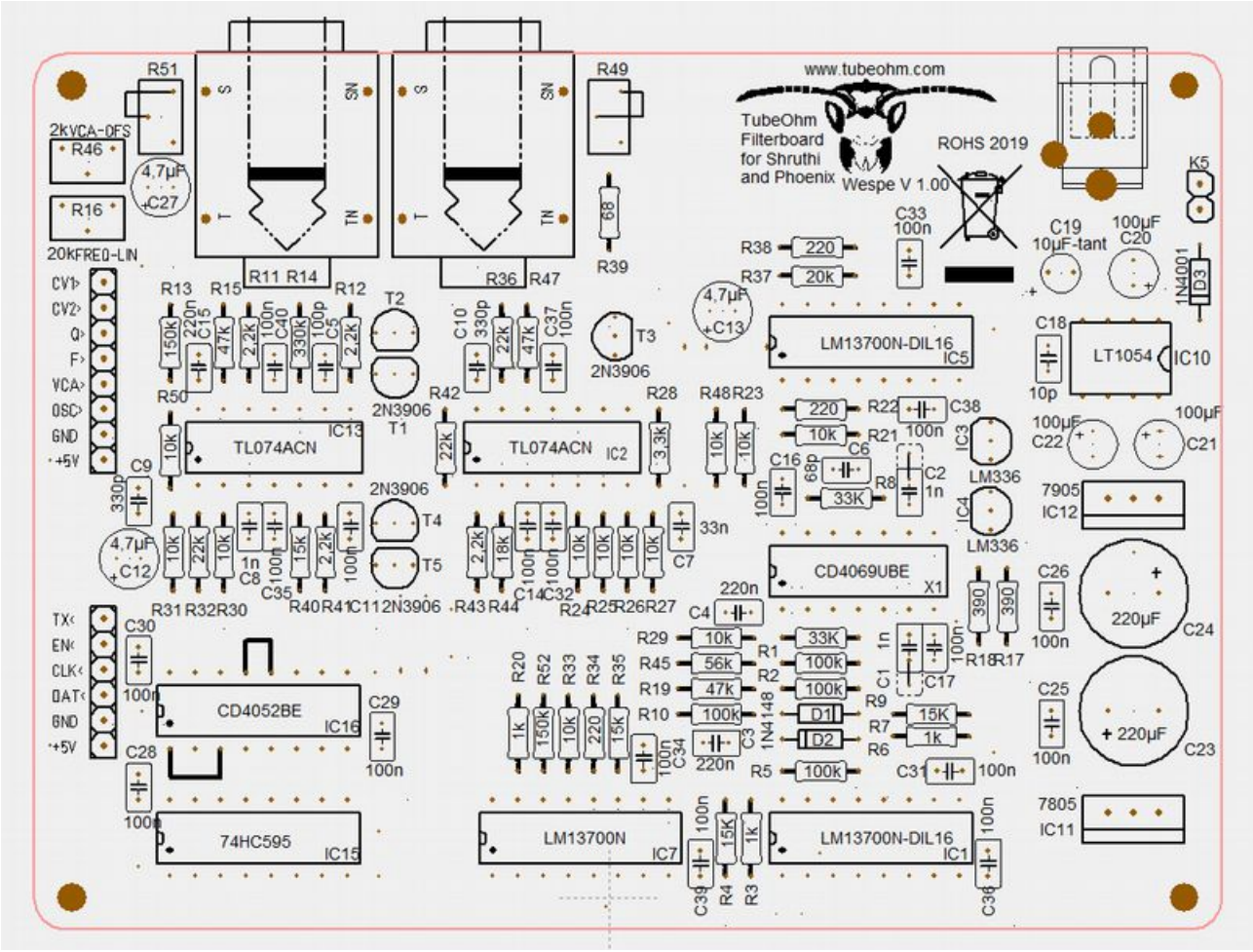
The picture here shows the finished motherboard. This is what it should look like afterwards.



To solder the filterboard we need the following tool

1:) a soldering iron / better temperature controllable / soldering tin
2:) a good one side cutter
3:) for testing the power supply, 9 Volt , 600 mA , plug outside 5,5 inside 2,1 plus in the middle
4:) a multimeter is always an advantage

Here is once again the placement plan directly from the layout program
A component has 2 values. Once the item number and then the value.



Example : R31 10Kohm
R31= the position number , the value (10k) is in the component
K is the abbreviation for Kilo, so 1000
Accordingly 10 Kohm are 10000Ohm !

This time a short foreword

The circuit boards are tested for function, components are bought from well-known manufacturers which are distributed by Mouser , Farnell , TME , Reichelt etc..
Should a kit not work so it was in the past 99.99%.
a bad to miserable work of the DIY builder.

The majority of mistakes are

1:) poor solder joints 95%
2:) wrong components in place 4.9999%

A kit should be fun to assemble and ideally work immediately. But it's like in real life, when you build crap then only crap comes out.

Therefore you should have some soldering experience! You can also practice soldering beforehand.
With a multimeter you should have measure the resistances
BEFORE SOLDERING
I'll check it out! It only takes a few seconds. Troubleshooting with subsequent mails takes much longer.

Component values

Especially the capacitors sometimes have a strange imprint.
If you're not sure you can email me. But please before you solder the components !

values of the capacitors as follows:

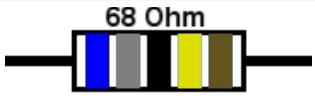
[101]=100 pF
[102]=1nF or 1000pF
[103]=10 nF
[104]=100nF
[224]=220nF

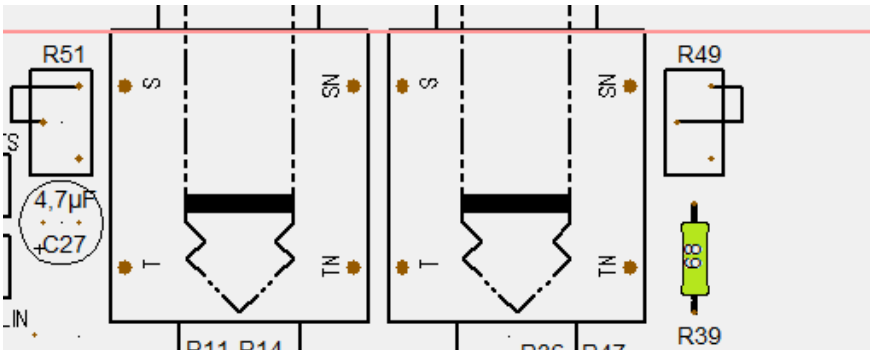
Depending on their availability, the capacitors can be change in its dimensions. It does not depend on how the capacitor looks like but on the value !

Okay, let's get started. In order to find the right positions you can use the IC names for orientation

First, we'll solder in the resistors.

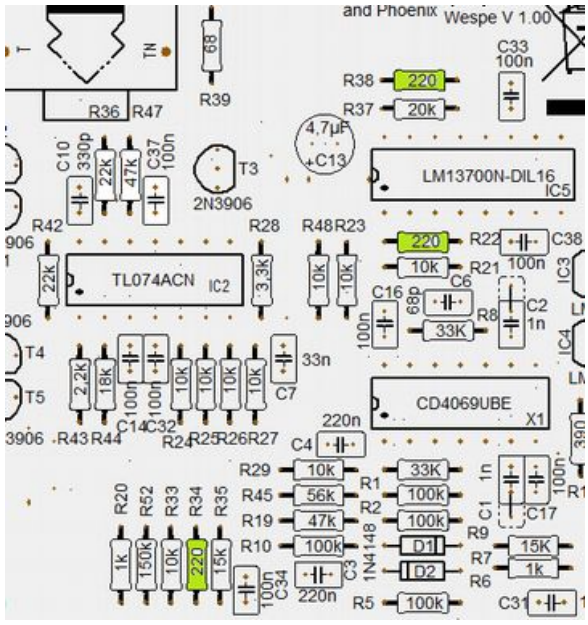
68 Ohm

Image	Description	Quantity	Notes
	68 ohm	1	blue, gray, black, gold brown R39



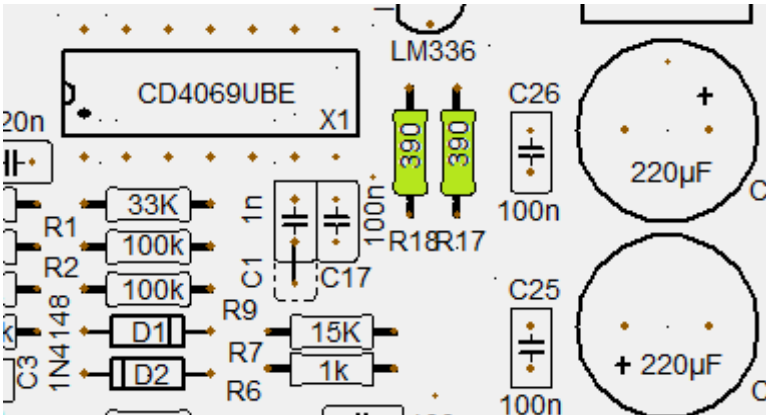
220 Ohm

Image	Description	Quantity	Notes
	220 ohm	3	red,red, black,black,brown R22,34,38



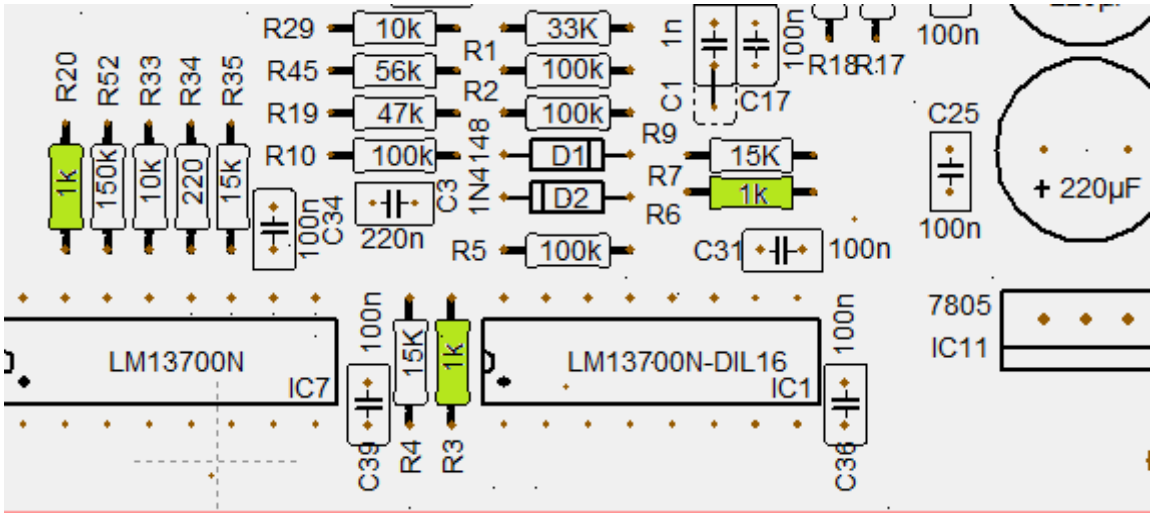
390 Ohm

Image	Description	Quantity	Notes
	390 ohm	2	orange,white, black,black,brown R17,R18



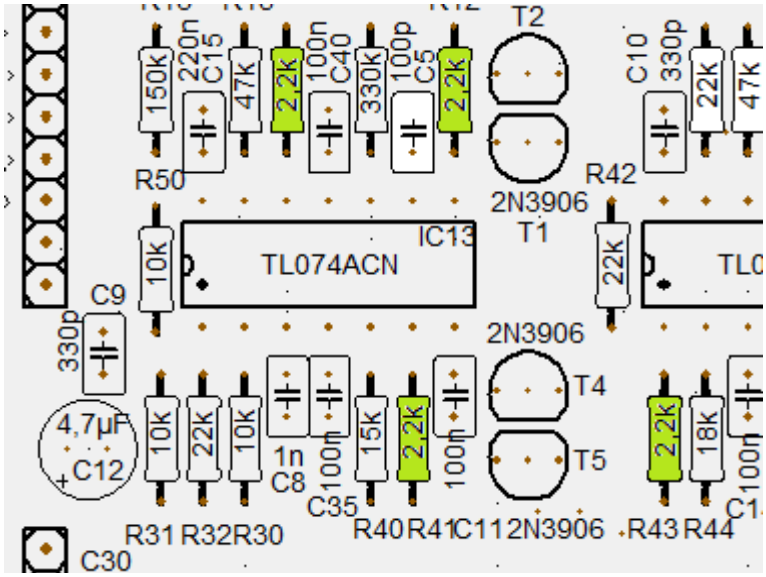
1KOhm

Image	Description	Quantity	Notes
	1kohm	3	brown, black,black,brown,Brown R3,R6,R20



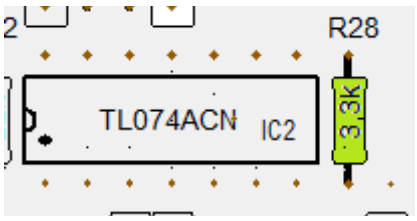
2,2KOhm

Image	Description	Quantity	Notes
	2,2Kohm	4	red,red,black,brown,brown R11,R12,R41,R43

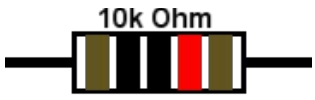


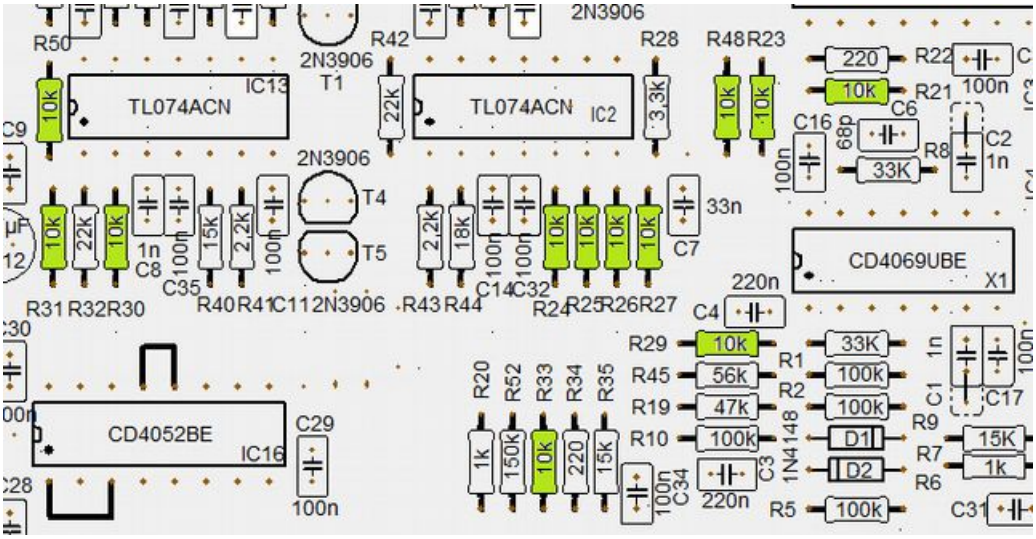
3,3 KOhm

Image	Description	Quantity	Notes
	3,3Kohm	1	orange,orange,black,brown,brown R28



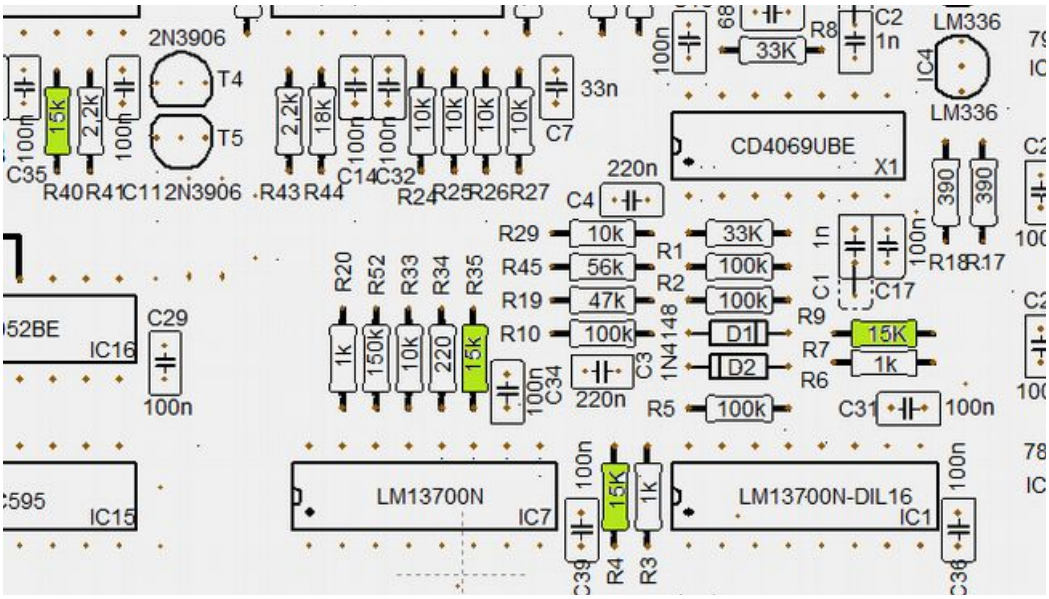
10KOhm

Image	Description	Quantity	Notes
	10Kohm	12	brown,black,black,red,brown R21,R23,R24,R25,R26,R27,R29,R30, R31,R33,R48,R50



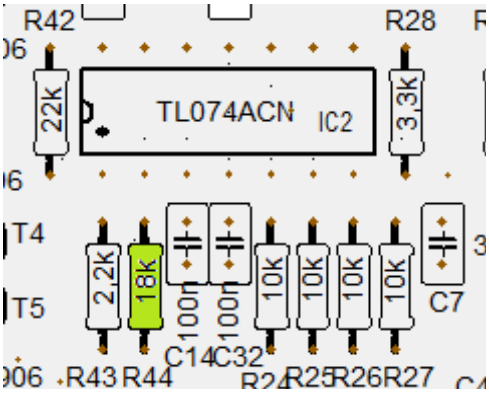
15KOhm

Image	Description	Quantity	Notes
	15Kohm	4	brown,green,black,red,brown R4,R7,R35,R40



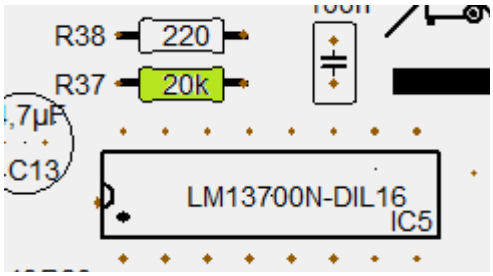
18KOhm

Image	Description	Quantity	Notes
	18Kohm	1	brown,gray,black,red,brown R44



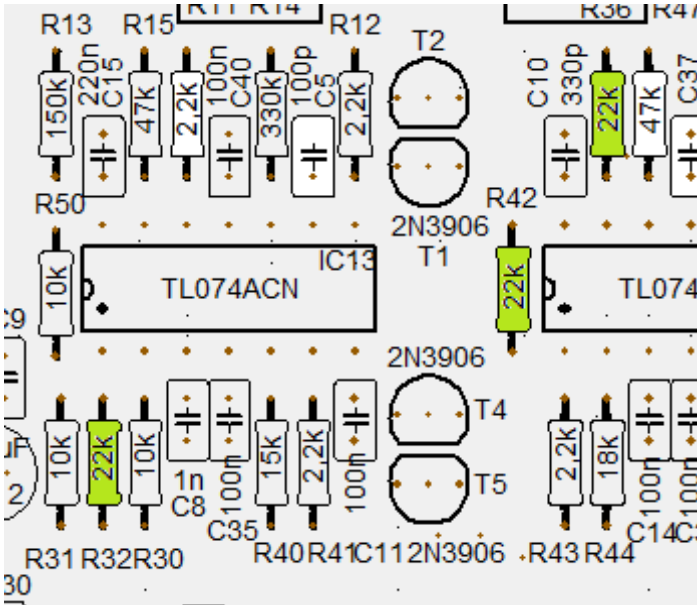
20KOhm

Image	Description	Quantity	Notes
	20Kohm	1	red,black,black,red,brown R37



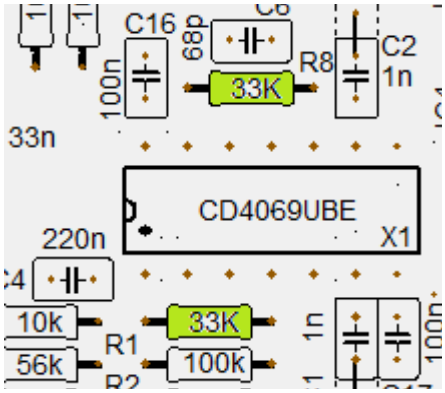
22KOhm

Image	Description	Quantity	Notes
	22Kohm	3	red,red,black,red,brown R32,R36,R42



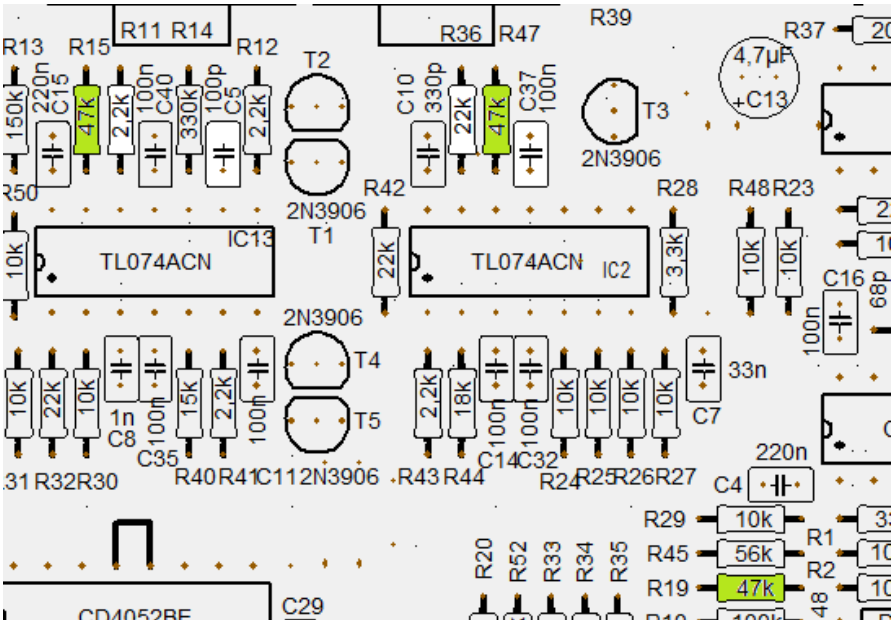
33KOhm

Image	Description	Quantity	Notes
	33Kohm	2	orange,orange,black,red,brown R1,R8



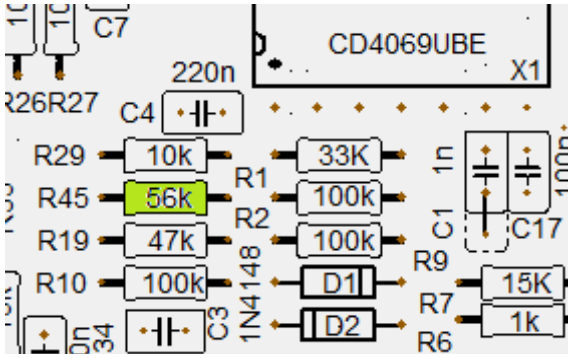
47KOhm

Image	Description	Quantity	Notes
	47Kohm	3	yellow, purple, black, red, brown R15,R19,R47



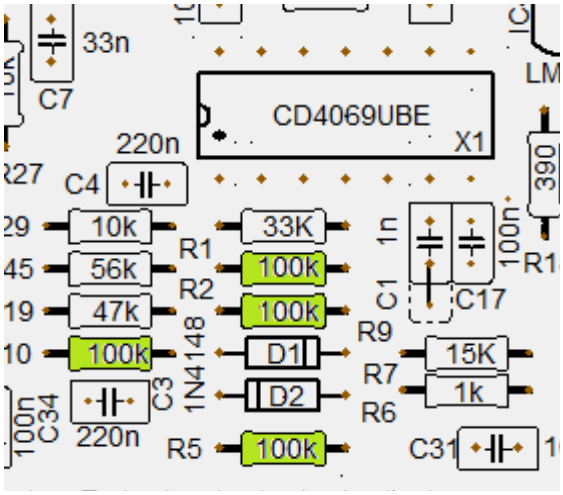
56KOhm

Image	Description	Quantity	Notes
	56Kohm	1	green,blue,black,red,brown R45



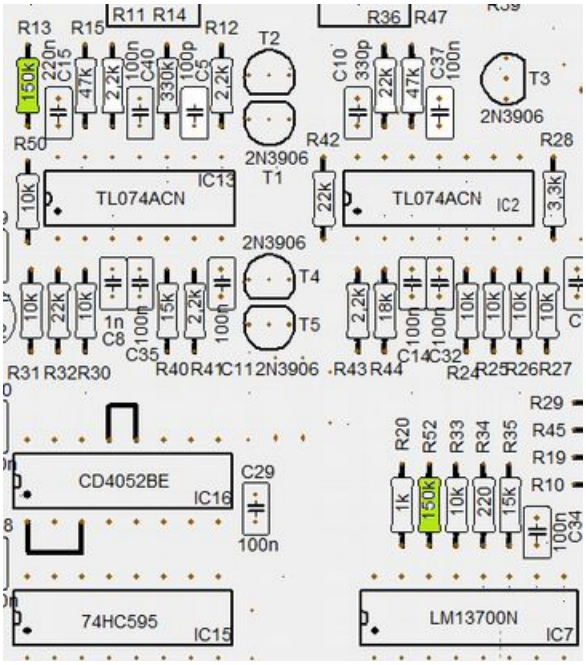
100KOhm

Image	Description	Quantity	Notes
	100Kohm	4	brown,black,black,orange,brown R2,R5,R9,R10

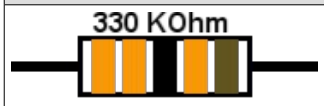


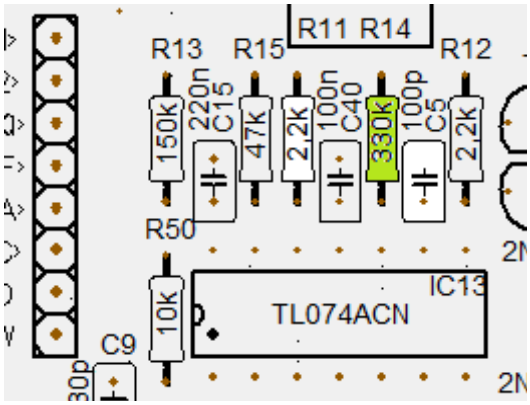
150KOhm

Image	Description	Quantity	Notes
	150Kohm	2	brown,green,black,orange,brown R13,R52



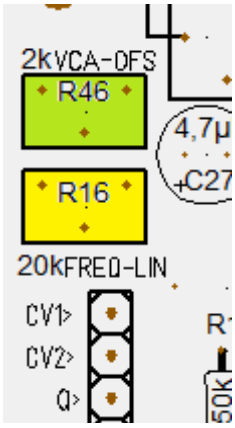
330KOhm

Image	Description	Quantity	Notes
	330Kohm	1	orange,orange,black,orange,brown R14



20k / 2k trimmer

Image	Description	Quantity	Notes
	1x 2 kOhm 1x 20 kOhm		R46, 2K marked 202 R16, 20K marked 203

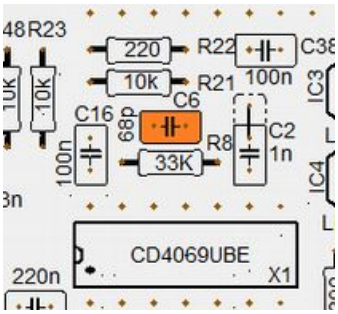


Now all resistors and trimmers should be soldered in. Please check it again !

Now the capacitors are soldered in

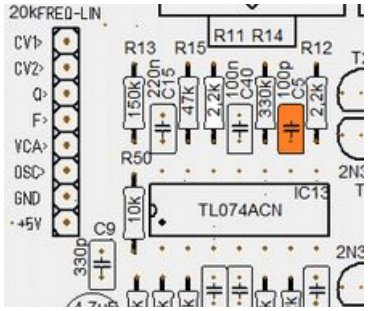
68pF

Image	Description	Quantity	Notes
	ceramic 68pF	1	Value [68] C6



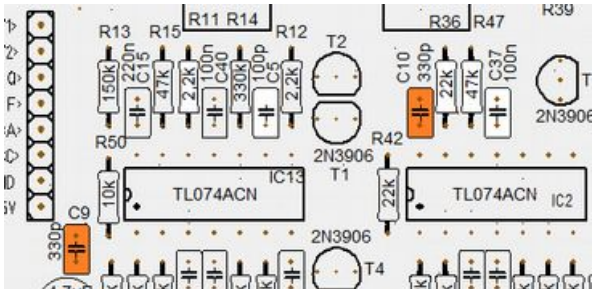
100pF

Image	Description	Quantity	Notes
	ceramic 100pF	1	Value [101] C5



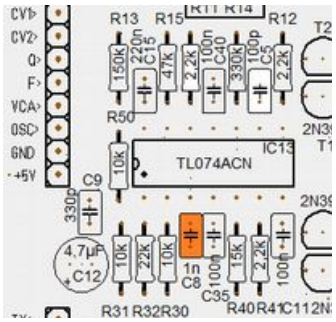
330pF

Image	Description	Quantity	Notes
	ceramic 330pF	2	Value [331] C9,C10



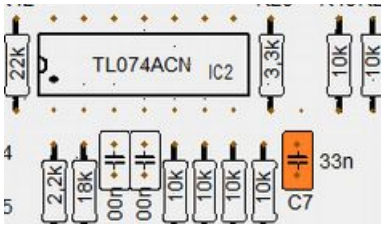
1 nF

Image	Description	Quantity	Notes
	ceramic 1nF	1	Value [102] C8



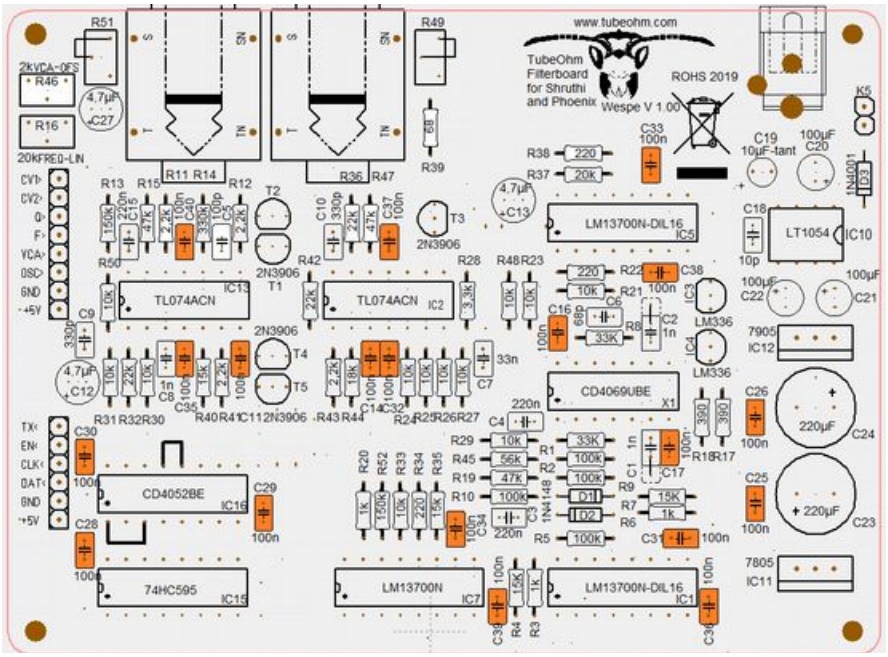
33nF

Image	Description	Quantity	Notes
	ceramic 33nF	1	Value [333] C7



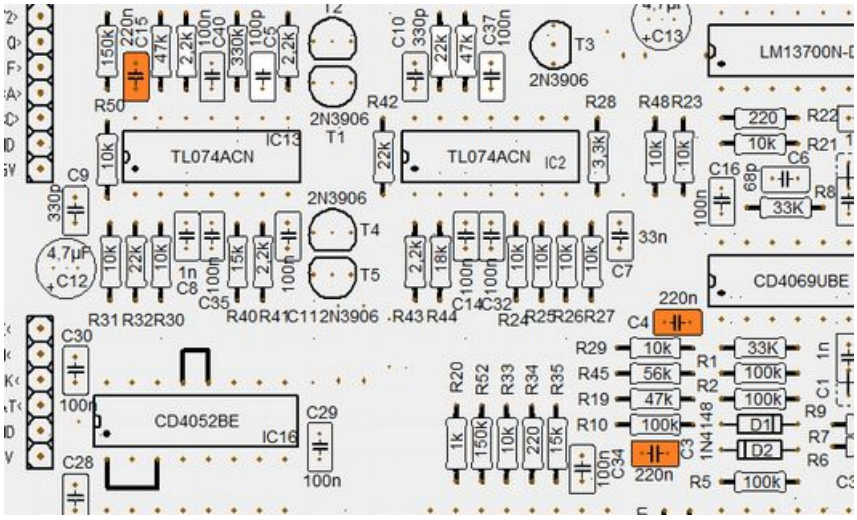
100 nF

Image	Description	Quantity	Notes
	ceramic 100nF	19	Value [104] C11,C14,C16,C17,C25,C26,C28,C29, C30,C31,C32,C33,C34,C35,C36,C37,C 38,C39,C40



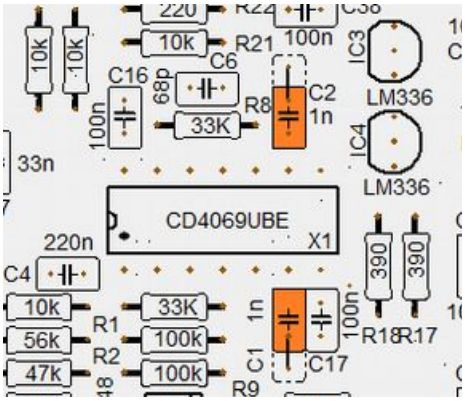
220nF

Image	Description	Quantity	Notes
	ceramic 220pF	3	Value [224] C3,C4,C15



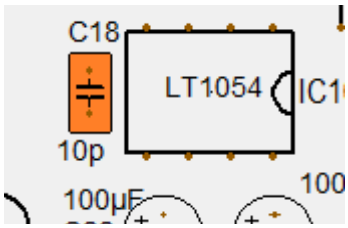
1nF caps for the filterpoles

Image	Description	Quantity	Notes
	1nF polyester/polyprop Filter caps Raster /grid can be 2,5 or 5 mm	2	Value 1n C1,C2



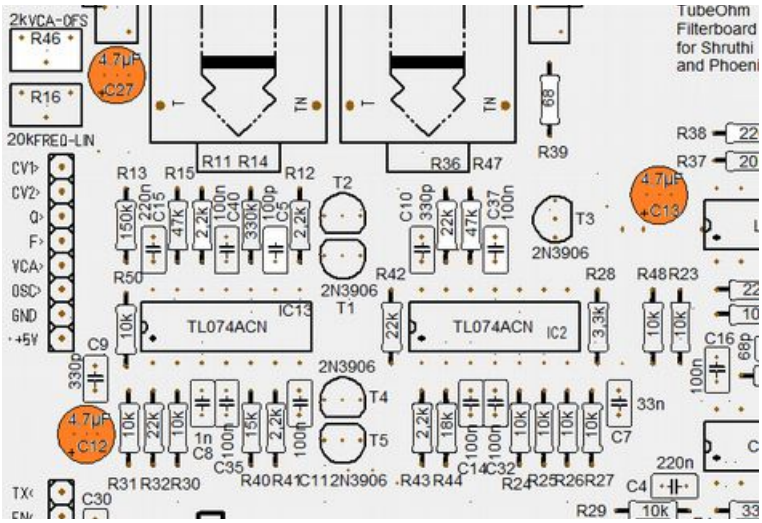
10pF

Image	Description	Quantity	Notes
	10pF ceramic	1	Value 10 C18



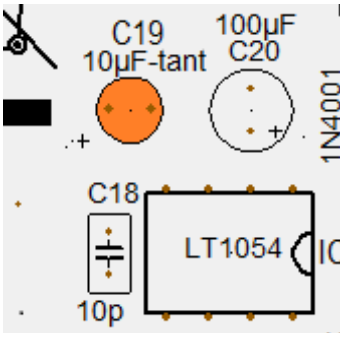
4,7uF NP

Image	Description	Quantity	Notes
	4,7uF elko NP	3	Value 4,7uF NP = non polarized audio elko C12,C13,C27



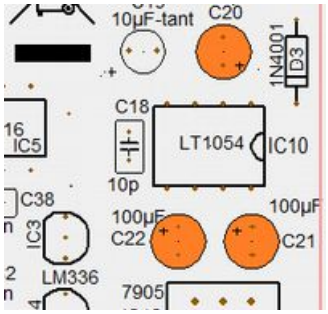
10uF

Image	Description	Quantity	Notes
	10uF tantal polarized (+) leg is marked	1	Value 10uF or 106 polarized (+) leg is marked C19



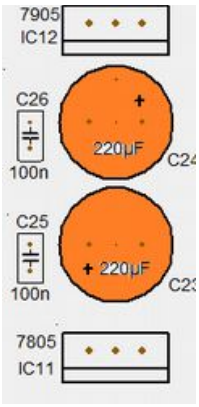
100uF

Image	Description	Quantity	Notes
	220uF elko (-) minus is short leg	3	Value 220uF polarized C23,C24



220uF

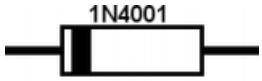
Image	Description	Quantity	Notes
	220uF elko (-) minus is short leg	2	Value 220uF polarized C23,C24

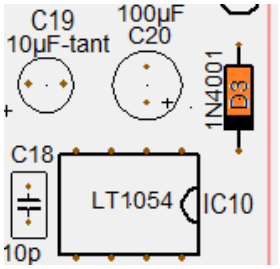


So, the passive components resistors/capacitors are soldered in.

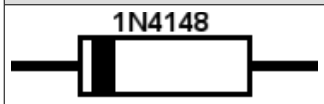
Now come the active components, diodes, transistors and voltage regulators.

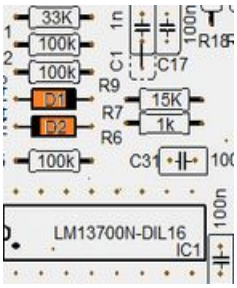
1N4001

Image	Description	Quantity	Notes
	1N4001 Diode (-) minus is the ring	1	Value 1N4001 polarized D3



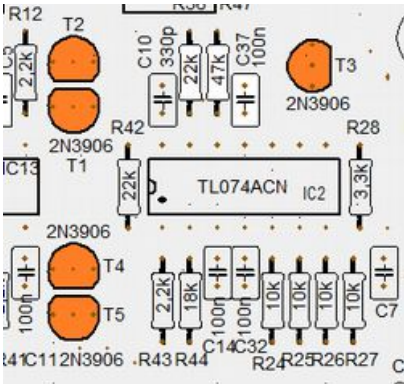
1N4148

Image	Description	Quantity	Notes
	1N4148 Diode (-) minus is the ring	2	Value 1N4148 polarized D1,D2



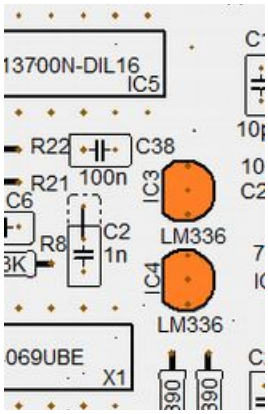
Transistoren 2N3906

Image	Description	Quantity	Notes
	2N3906 Transistor	5	Value 2N3906 T1,T2,T3,T4,T5



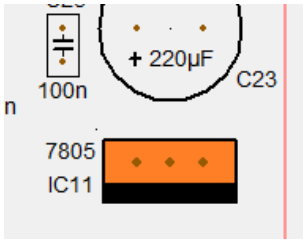
Voltage regulator LM336 2.5 Volt

Image	Description	Quantity	Notes
	LM336 2,5 V Z-Diode	2	Value 336-BZ-2.5 V IC3,IC4



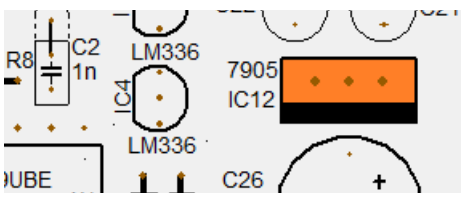
(+) Voltage regulator 7805

Image	Description	Quantity	Notes
	7805 positiv 5 V regulator	1	Value 7805 polarized IC11



(-) Voltage regulator 7905

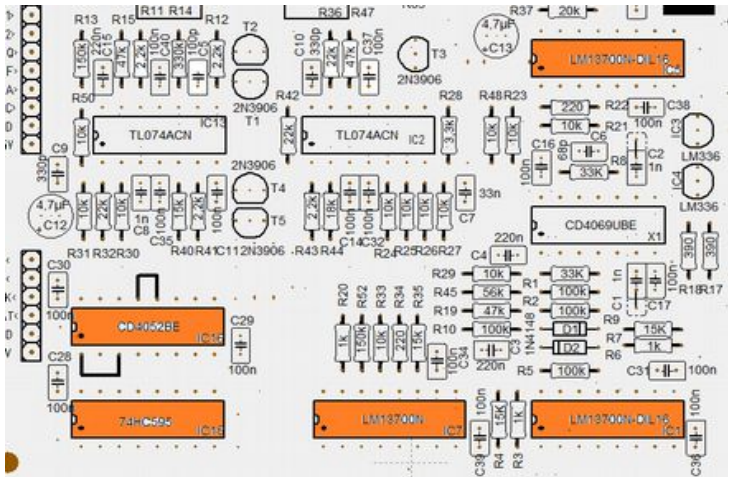
Image	Description	Quantity	Notes
	7905 negativ 5 V regulator	1	Value 7905 polarized IC12



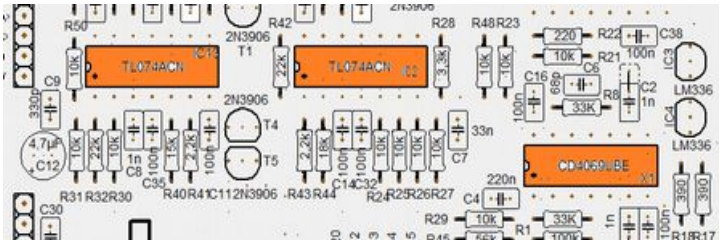
It's starting to happen. Now come the mechanical parts, IC sockets, audio sockets and the socket for the power supply as well as the connectors for the motherboard.

Image	Description	Quantity	Notes
	5x16 pin IC socket 3x14 pin IC socket 1x8 pin IC socket		Attention , the sockets are marked .

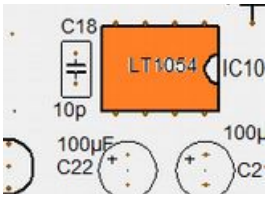
IC socket 16 pin



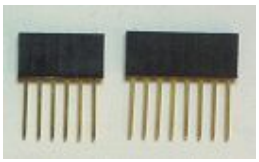
IC socket 14 pin

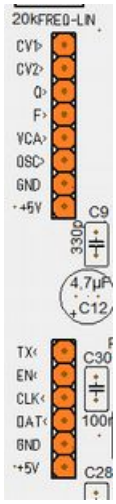


IC socket 8 pin



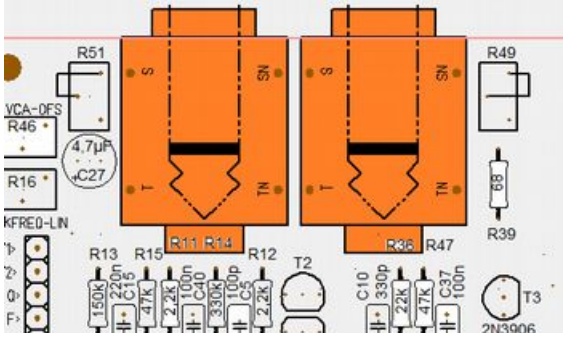
Arduino header-motherboard

Image	Description	Quantity	Notes
	Header 6 pin K1 Header 8 pin K2	2 2	Header 6 pin K1 Header 8 pin K2



Audio Jack 6,3

Image	Description	Quantity	Notes
	Jack 6,3 K6,K20	2	Jack 6,3 K6,K20



9V Jack

Image	Description	Quantity	Notes
	9V Jack K4	1	9V Jack K4

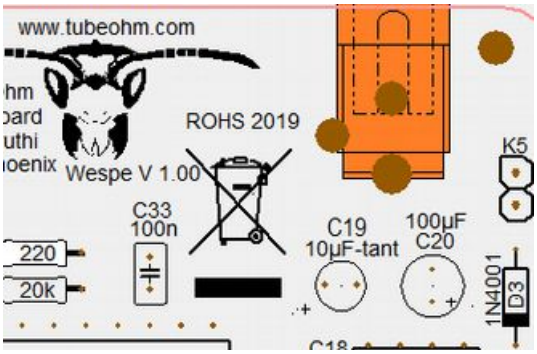
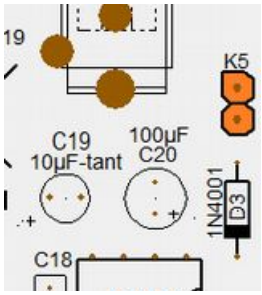
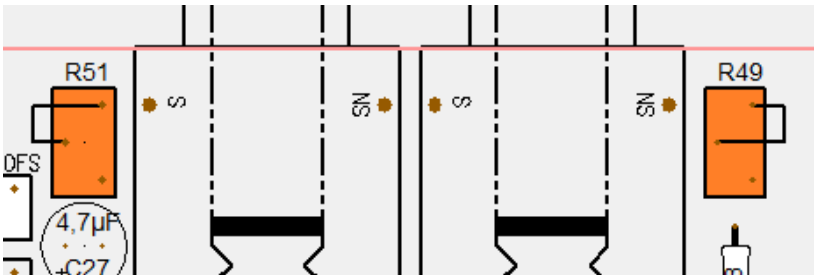


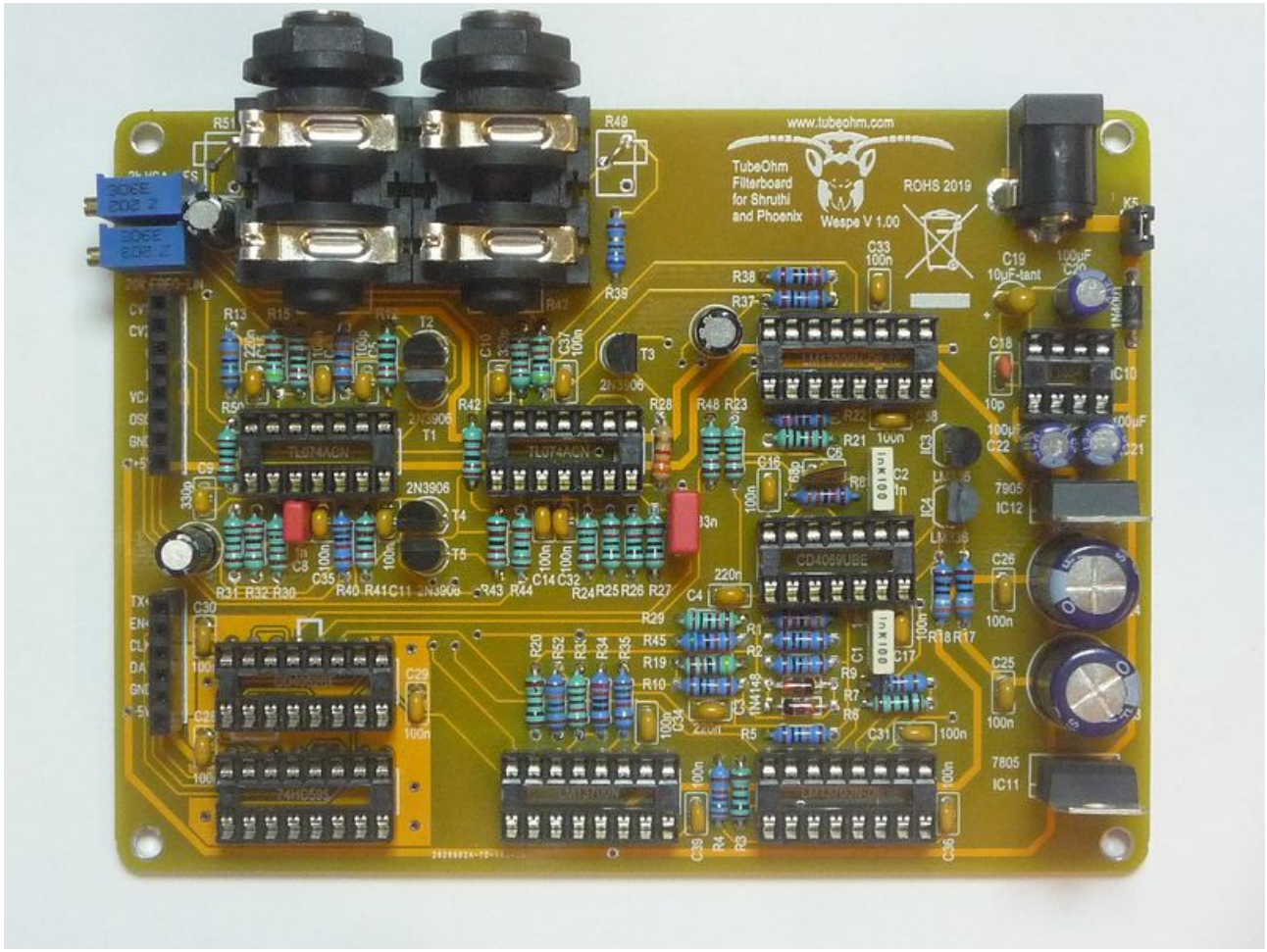
Image	Description	Quantity	Notes
	2 pin for E/A switch	1	2 pin for E/A switch



These were the last components.
Attention, don't forget to bridge R49 and R 51. Otherwise no audio signal comes from the audio sockets.



When you have done all the steps then the filterboard should look like the one on the image



First we will measure the voltages again with a multimeter.
The ICs can be plug in after the voltage test.

4 voltages are measured against ground.
As ground you can use the cooling vane of the 7805. Attention !! only those of the 7805!

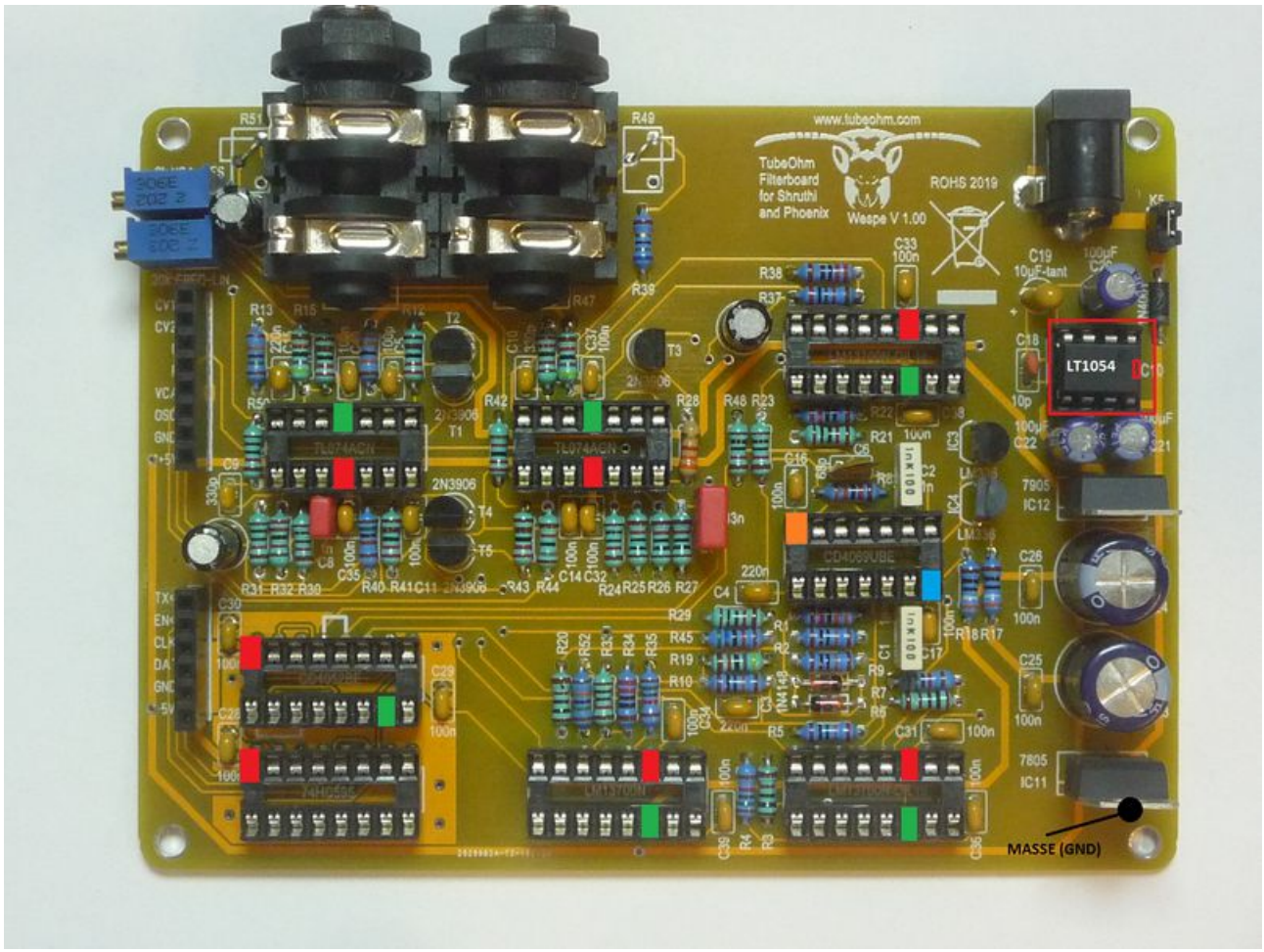
First the IC 10, the charge pump LT1054 CP is inserted into the circuit board.
This generates together with the 7905 the negative 5 Volt.
Pay attention to the marking of the IC.

Then you should bridge also still K5 otherwise no voltage comes into the board.
The on/off switch will be connected to K5 later.

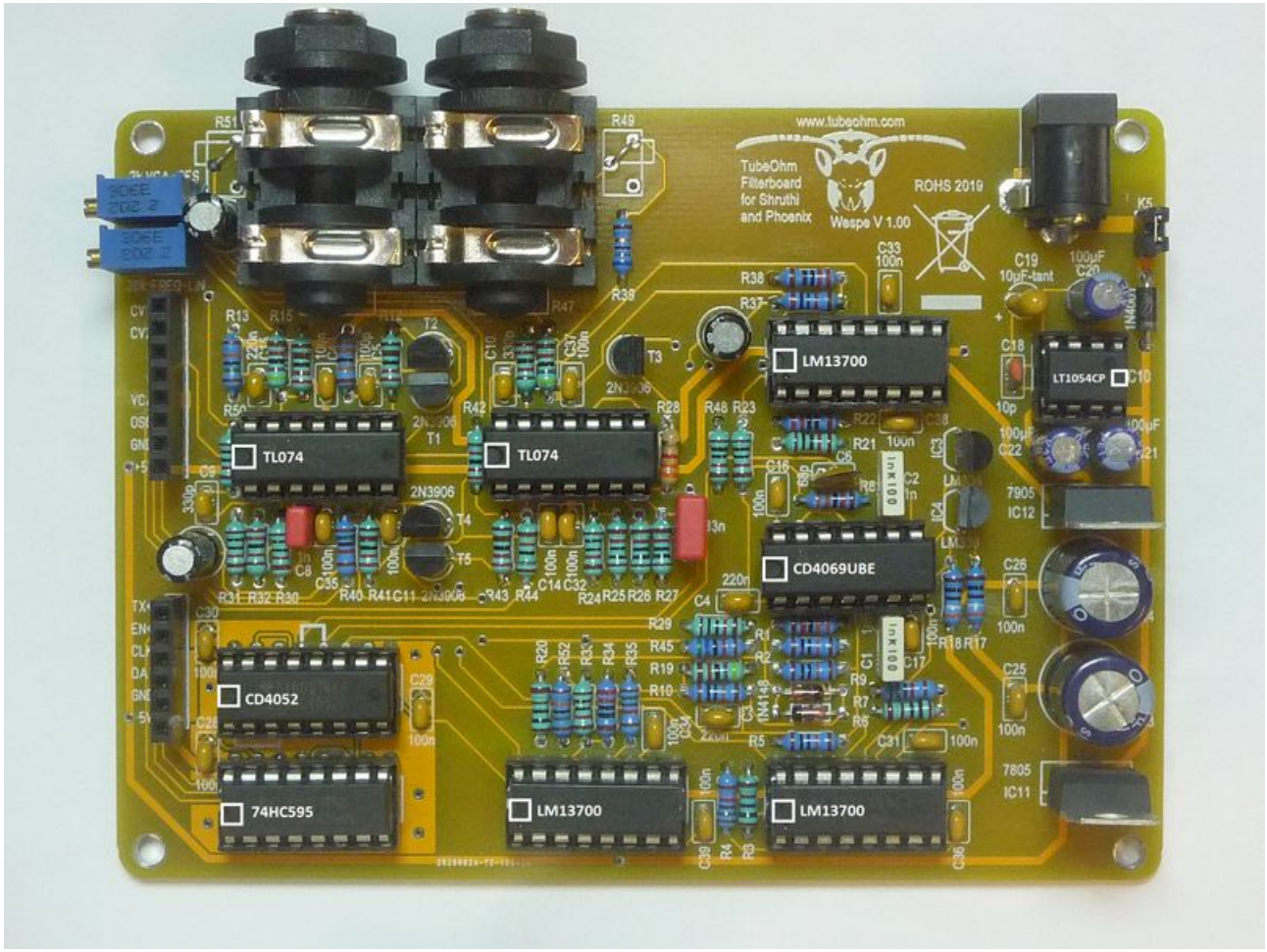
We have 4 different voltages - measured against ground

- 5 Volt 4,9...5,1 is OK
- -5 Volt -4,9...5,1 is OK
- +2,5Volt für das IC CD 4069 2,45 is also OK
- -2,5 Volt für das IC CD 4069 -2,45 is also OK

MASSE



If all voltages are correct the IC's can be insert.

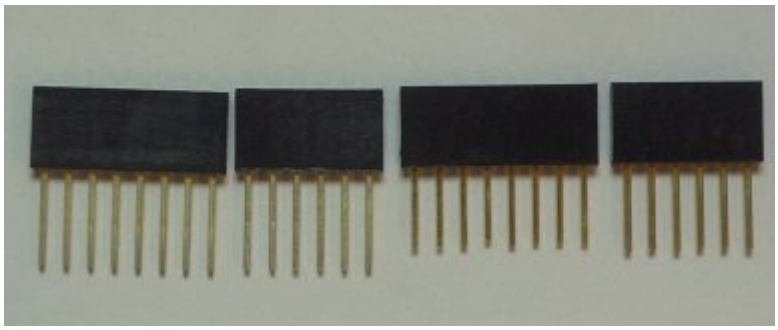


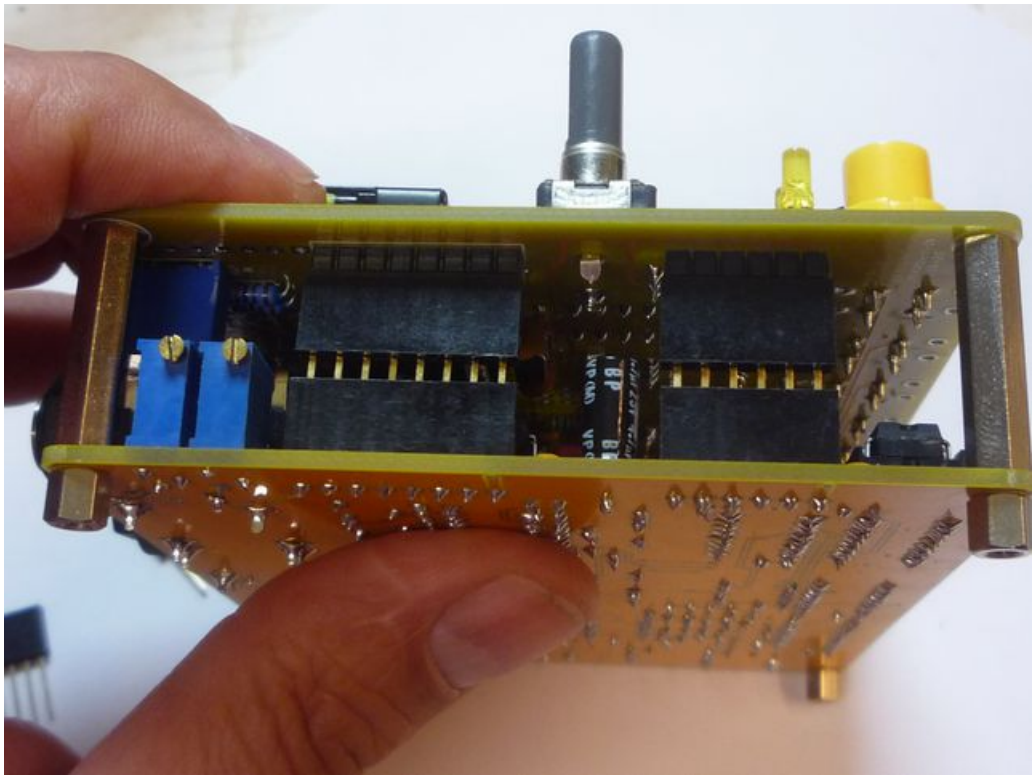
The adjustment is not very difficult because the filter is non-linear anyway.
With the potentiometer 20k FREQ-LIN the frequency is adjusted so that the filter doesn't sound dull in the treble.

With full distortion and resonance it can be that the sound still shimmers through although no key is played.
With the 2K OFS trimmer the VCA can be adjusted to close completely. Resonance and distortion are set to maximum and the trimmer is set so that nothing can be heard. This is the optimal setting for the VCA.

***The CPU does not give the PWM signal From 0... 5 Volt but from approx. 0,1... 5V.
This 0.1 Volt is sufficient to open the VCA slightly. With the 2K trimmer you can
this offset is shifted to 0 - i.e. the 0.1 volts are controlled to 0.

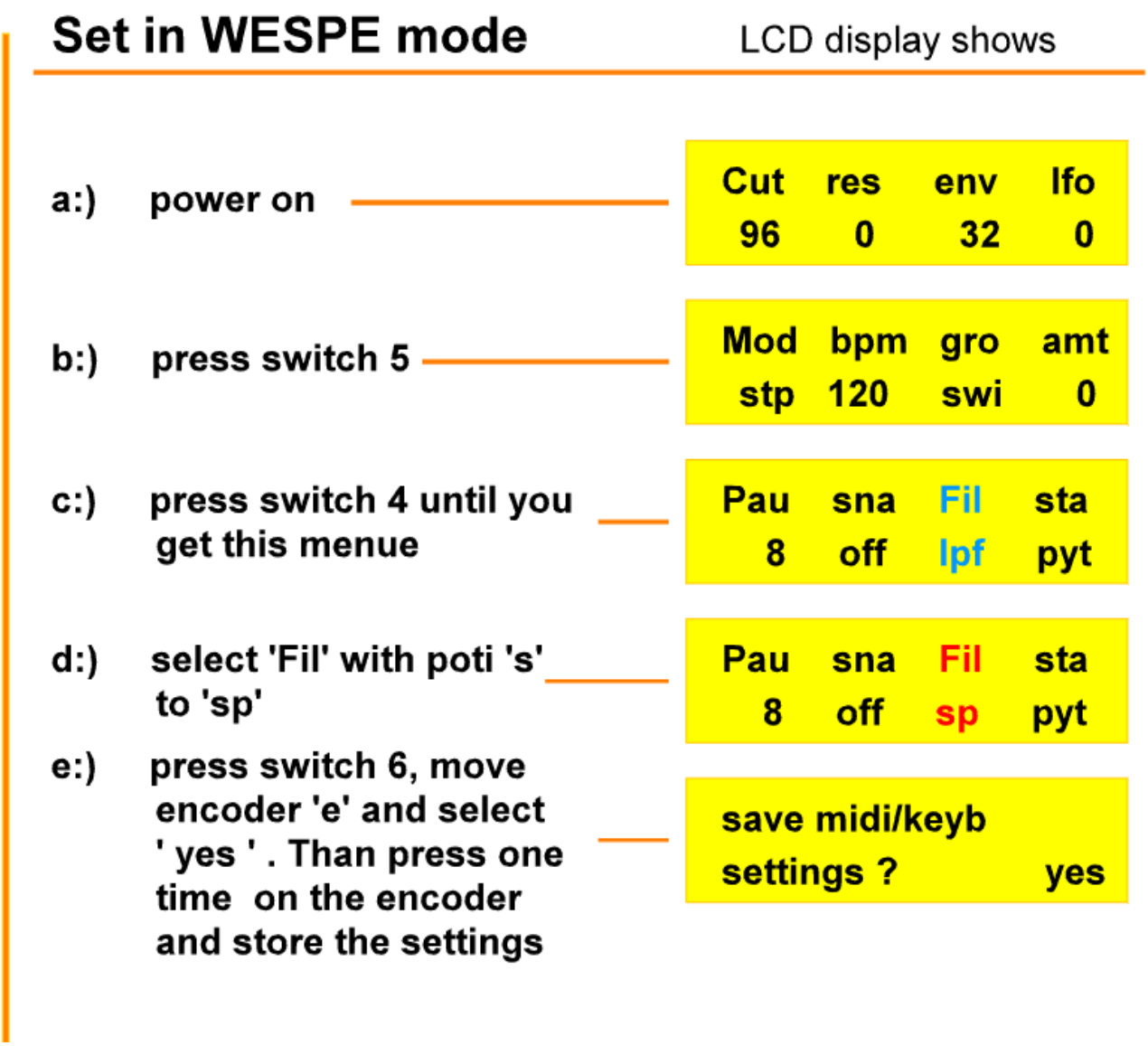
The filter board is connected via the two additional ARDUINO headers.
Both headers must be shortened at the legs by approx. 1..1.5 mm.





After the filterboard is connected to the motherboard, the software has to be adjusted to the new filterboard. After that you will also get the second menu
For the filter.

The software setting is SP.



That's it. Have fun with the CD 4069 filters

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