SLQ51X

Introduction

Let me Introduce this nice Program - Equalizer in the Style of an British Console EQ. I have designed this familiar EQ in 500 API compatible Format. It works in 500 VPR or 51X Lunchboxes on the +16V and -16V rails. I used mainly the shematic of the 4000 EQ with an extra THAT 1246 In- and THAT 1646 Outputstage. In my Version I added switchable Low Cut and High Cut Filters for full Flexibility in colouring sound with this EQ Module. This Guide will help with setting up this nice EQ. Have Fun!

TABLE OF CONTENTS

DISCLAIMER: Proceed at your own risk. I am not liable for any damage, harm or loss of any kind resulting from the assembly and/or use of this PCB set. Safety provisions should always be exercised whenever working with any electronics. The following instructions are guidelines only. I can make no guarantee of the accuracy of contents contained within this document.

Functions

This Pot levels the amount of the High Frequency Band in a range of +/-15dB Gain

This Pot levels the amount of the High Mid Frequency Band in a range of +/-15dB Gain

This Pot sets the Q-Factor of the HMF Band from narrow to wide

This Pot levels the amount of the Low Mid Frequency Band in a range of +/-15dB Gain

This Pot sets the Q-Factor of the HMF Band from narrow to wide

This Pot levels the amount of the Low Frequency Band in a range of +/-15dB Gain

This Switch turns from BELL-MODE into SHELF-MODE of the HF-Band

This Pot sets the Frequency of the High Frequency Band in a range of 1.4kHz to 14kHz

This Pot sets the Frequency of the High Mid Frequency Band in a range of 0.6kHz to 7kHz

This Switch turns on the High Cut Frequency Filter at 8kHz

This Switch enables the Equali-zer. Unpowered True Bypass

This Switch turns on the Low Cut Frequency Filter at 80 Hz

This Pot sets the Frequency of the Low Mid Frequency Band in a range of 0.2kHz to 2 kHz

This Pot sets the Frequency of the Low Frequency Band in a range of 30 Hz to 450 Hz

This Switch turns from BELL-MODE into SHELF-MODE of the LF-Band

Variants of Filters

First of all these nice High and Low Cut Filters are set at fixed Frequencys. In my design i set these Frequency for Low Cut at 80Hz and for Hgh Cut at 8kHz. For learning about Filter design I really can recommend this webpage:
http://sim.okawa-denshi.jp/en/Fkeisan.htm
For all who want to change these Frequencys you are welcome to do it on your own by changing resistor values. The Calibration Process of this Filter will be at the end of the guide.

LOW CUT Resistor changes

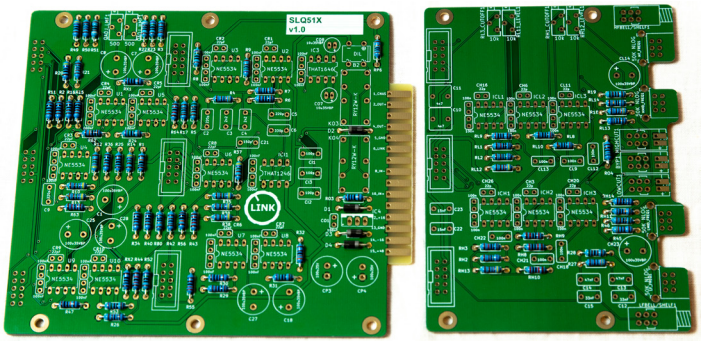
Change all to the same value **RH8,RH9,RH10**
50Hz - 33k
60Hz - 27k
80Hz - 20k (standard value supplied with the kit)
100Hz - 16k
120Hz - 13k
160Hz - 9.1K

HIGH CUT Resistor changes

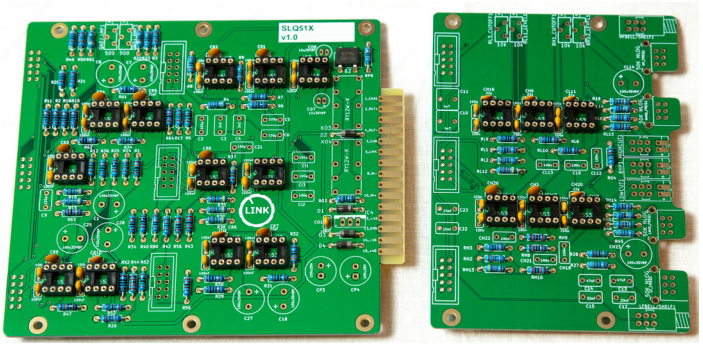
Change all to the same value **RL10,RL8,RL9**
5Khz - 330R
6Khz - 270R
8Khz - 200R (standard value supplied with the kit)
10kHz - 160R
12Khz - 130R
16Khz - 91R

Stuffing Boards

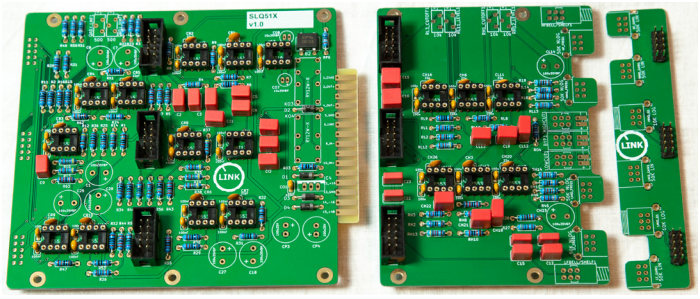
After we decided which High and Low Cut Filters we want use, we will go over for stuffing the boards. First Step is to place all Resistors and Diodes. Check before Soldering if your Diode-Placement is right.



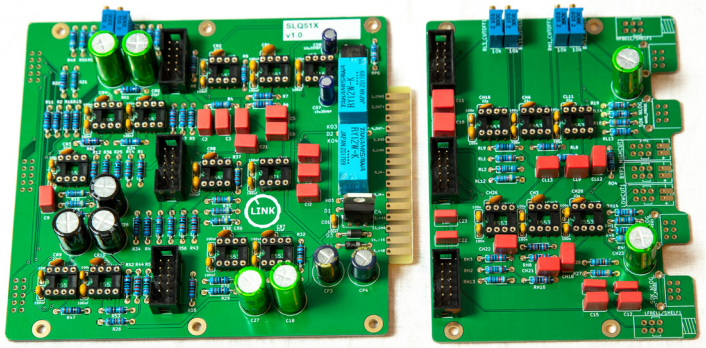
After Placing and Soldering all Resistors, we solder the next bigger parts like IC-Sockets and small Capacitors, like 37x100nF and 16x22pF



After that Step solder all Wima Capacitors and Board Connections like on the pictures. on the Small Board, the short pins are soldered as close as possible to the board. Its important that you press them in place during Soldering, we need that because of the mechanical assembly later.

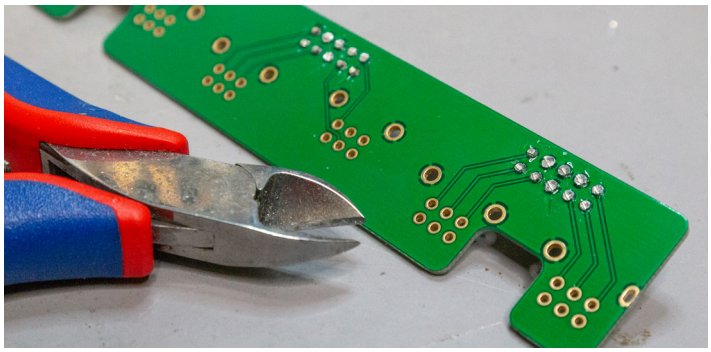


Now we head over to bigger parts like Relais, Voltage Regulator and Electrolyt Capacitors, keep in mind the Orientation of CP3 and CP4. The other Capacitors are NonPolar/Bipolar So the Orientation doesn‘t matter. But it‘s important that C1,C25,C28 need to be the short ones (16mm). The others are 20mm high. After this step you can clean the boards. After cleaning boards with alcohol/water/your preferred method you can solder the trimpots. But don‘t clean after trimpots. Trimpots, Switches, Potentiometers don‘t like cleaning and can lead to problems with electrical contact.

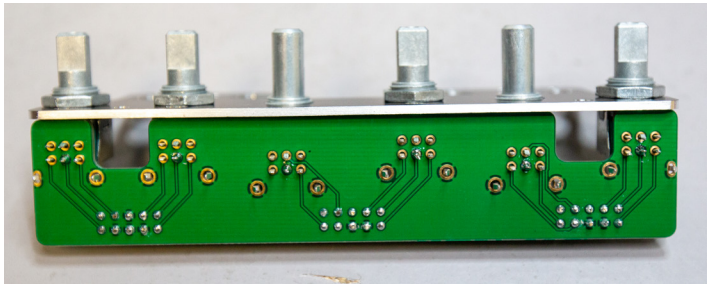


Potentiometers,Switches and LEDs

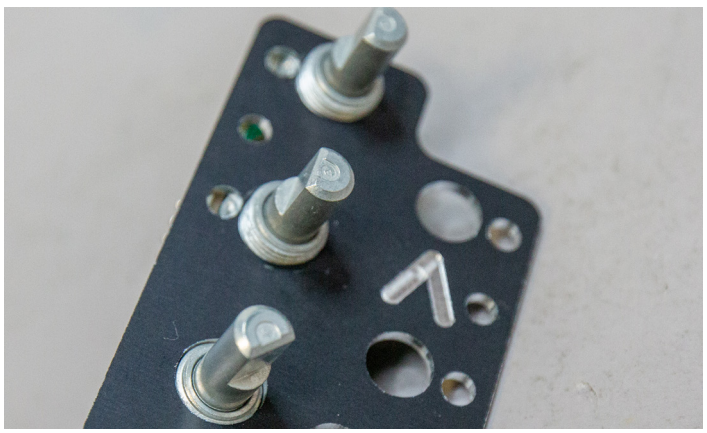
Now we are heading again to the subboards, first we take the small one and cut all leads of the pinrows as short as possible, we do this process later also with potentiometers since we need to make sure that this Equalizer don‘t touch any neighbour modules of any kind



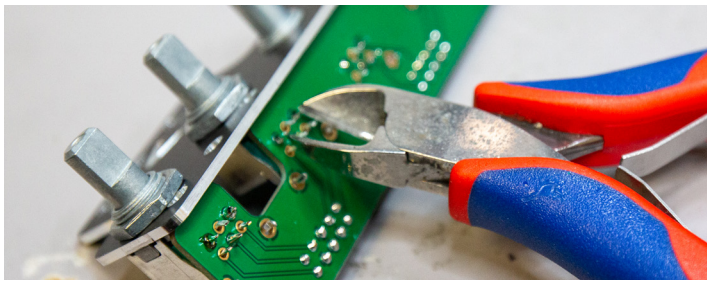
Since we have shortend we install all pots on this board at the same time. get all pots on the PCB and solder just one pin in the middle and press the POT as much as possible on to the PCB. After Soldering one Pin make sure the alignement of the pot is straight. You can check that with printed silkscreen on the PCB.



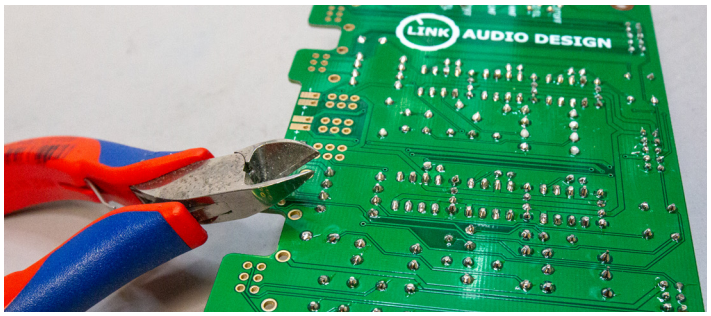
After having one pin of each pot soldered we add the bracket like in the picture shown. The direction of the bracket is shown in the other picture. After having all pots screwed to the bracket, we can solder all pins, after that we need to cut



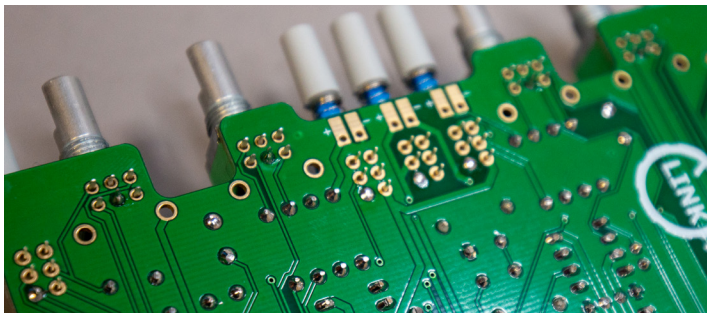
After having all pots screwed to the bracket, we can solder all pins. I cut all the pins before soldering, then they look better, but you can also cut them also after. Then unscrew the board from the bracket.



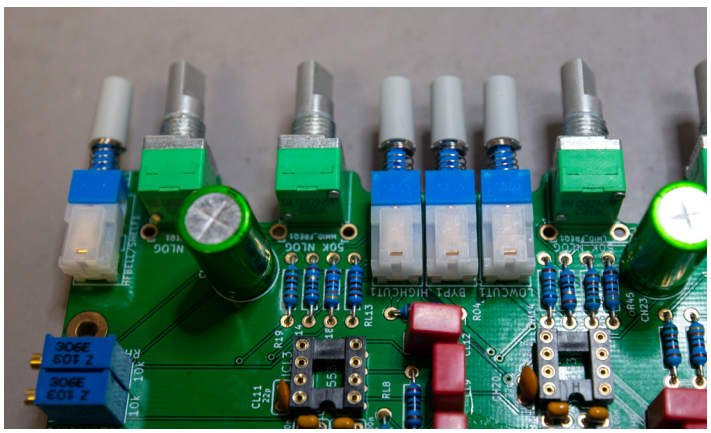
In the next Step we cut all leads on the upper subboard as short as possible.



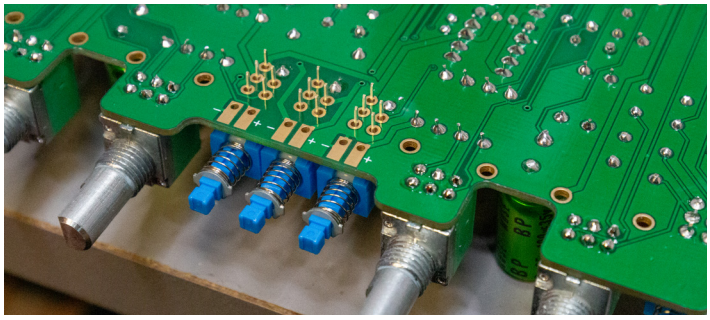
The next step is focusing on the pots and switches of the upper subboard we can solder all pots and switches and press them direct on the board with one solder point.



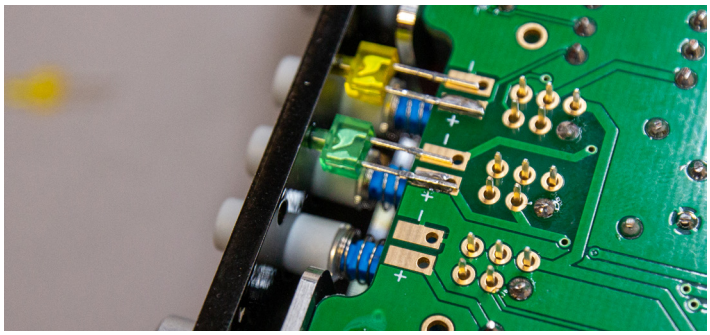
And check again the alignment of the Switches and the pots from upside and try to do it best like the silkscreen is printed. After that install blank bracket on the upper subboard and solder the pots in place.



Now it‘s time to use the Frontpanel for the first time to get the Switches and LEDs in place. Use the spacers and bring the Frontpanel in place with subboard. You can use the nuts to screw it together, but you also can use clamps to press bracket and frontpanel together. Install the pushbuttons and rearrange the switches on the PCb until they are in the middle of the hole of the Frontpanel. After this process you can solder them completly. After the whole soldering of pots and switches make sure they are also cutted.



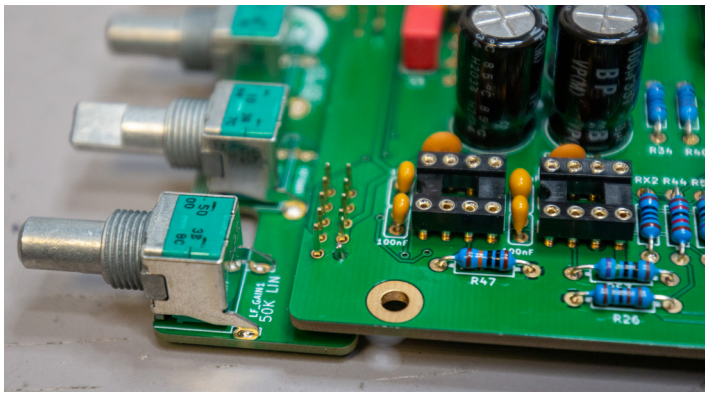
Now we cut the LEDs make sure you have the right leg for + and - (Long leg is + and short leg is -). I usually cut them not straigt and keep two different long legs that you still know which leg goes to + and -. Make sure the LED is faceing with the forntpanel in one level. First solder one leg to make sure the LED is in place, then solder the other leg. After the whole process, unscrew the Frontpanel and the Bracket, we need that for next step again.



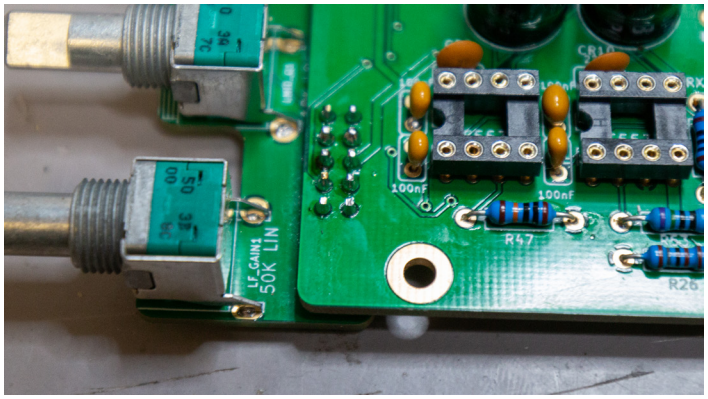
Final Assembly

For the final assembly we need first to bring the small subboard and the mainboard together. For this we need to build two small adapters for the right height. we use a screw and a nut from the hardware pack. Both adapters used in the corners and just placed there during the process of soldering on a table.

Now we gonna solder the pins of the headers. First one pin of each row. Every time we solder one pin we press the boards together.

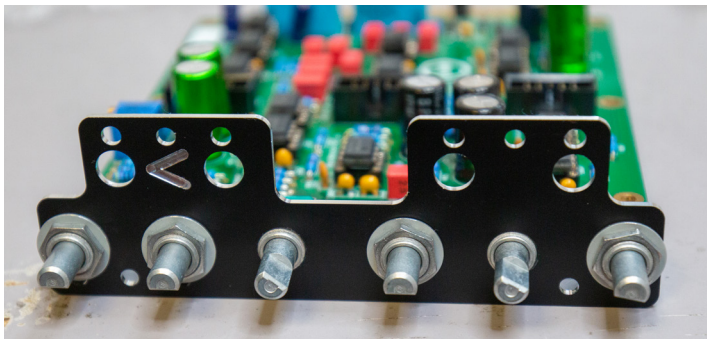


After that we can solder all the other pins and cut the pins also as short as possible. Then you can split our built adapter again in two parts

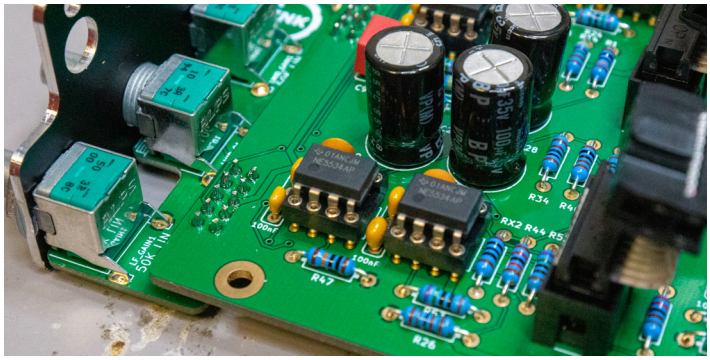


Now we have soldered all parts and want to check without ICs/OPVs if the Voltages are on the right places. For that we don‘t use the frontpanel or the bracket. We use the ribbon cables to connect the boards together. Use a adapter for your lunchbox/or power it up on another way to get it done on the bench and measure all Voltages near the ICs. The Voltage Meter should show something like +/-15,3V, it‘s because of the drop of the diodes of the power input. check also if the LEDs are working and the relais are switching. If everything seems good install the ICs. Check the Orientation of each IC before installing.

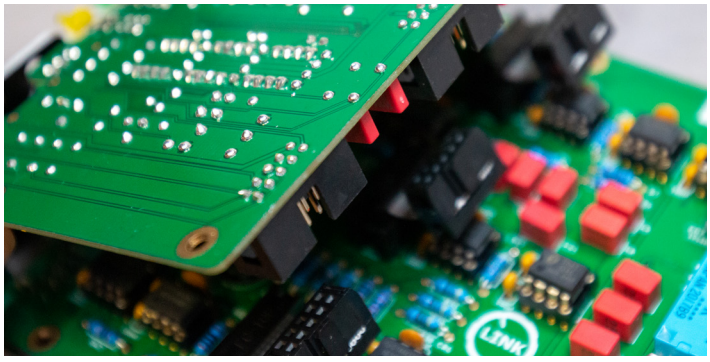
First we use the bracket to install the mainboard. with the M9 nuts for the Gain Pots.



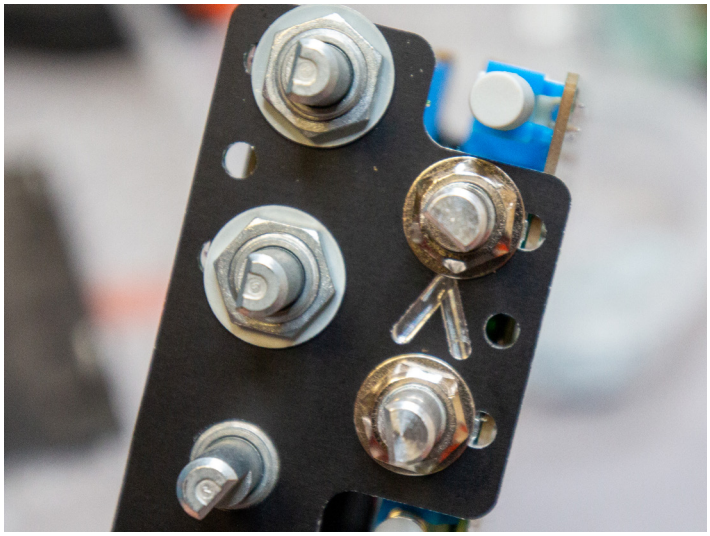
Then check again all ICs for the right orientation. put all the ribbon cables on the mainboard.



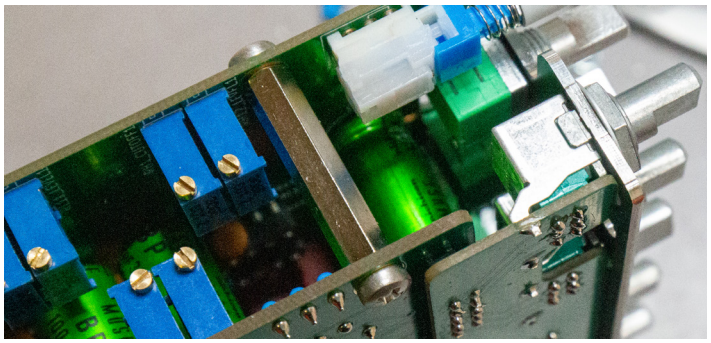
Now we install the upper subboard by adding it angled and connect the ribbon cables at the same process.



Add the nuts for the M7 Frequency Pots.

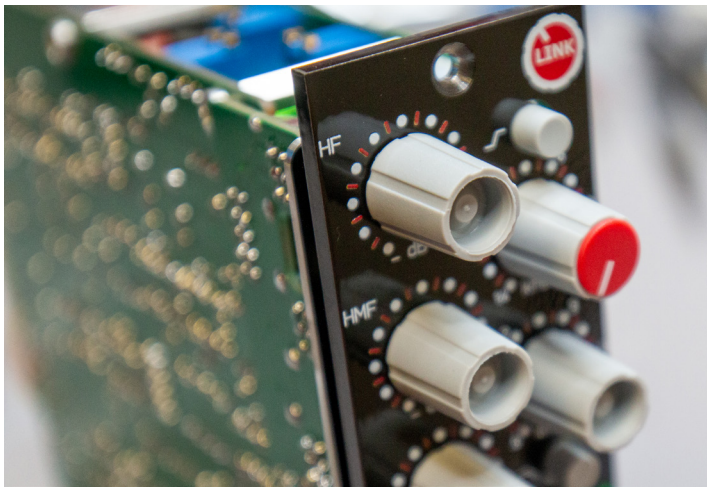


Now we add the 25mm Spacers between the two boards and screw them together.

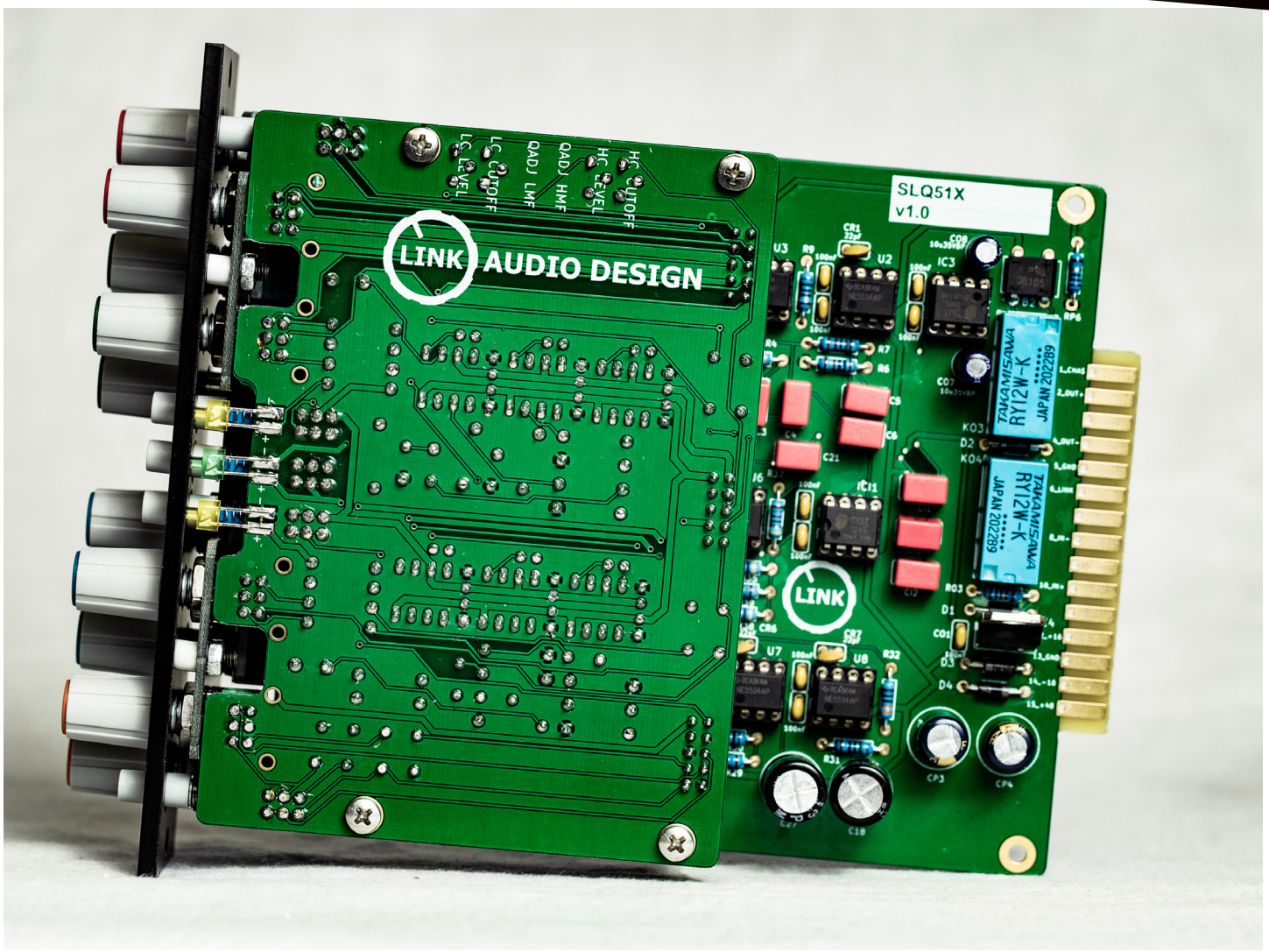


Now it‘s time to add the Frontpanel to complete the Equalizer. Use the spacers and the M3 Nuts to finish it. The Caps for the Knobs are sorted as following:

Red - HF
Green - HMF
Blue - LMF
Orange - LF



After finishing try to run Audio thruw the Unit and try all switch modes, if everything works fine in the next step we will calibrate this wonderful Equalizer.



Calibration

Calbration of this unit is no Rocket Science and it‘s quite easy. You need to playback different Sinus tones in different levels and frequency, make sure you have enough headroom that you don‘t get clipping when capture the response of the EQ. That works with every DAW but the easiest way to calibrate this EQ is using the freeware sofware REW.

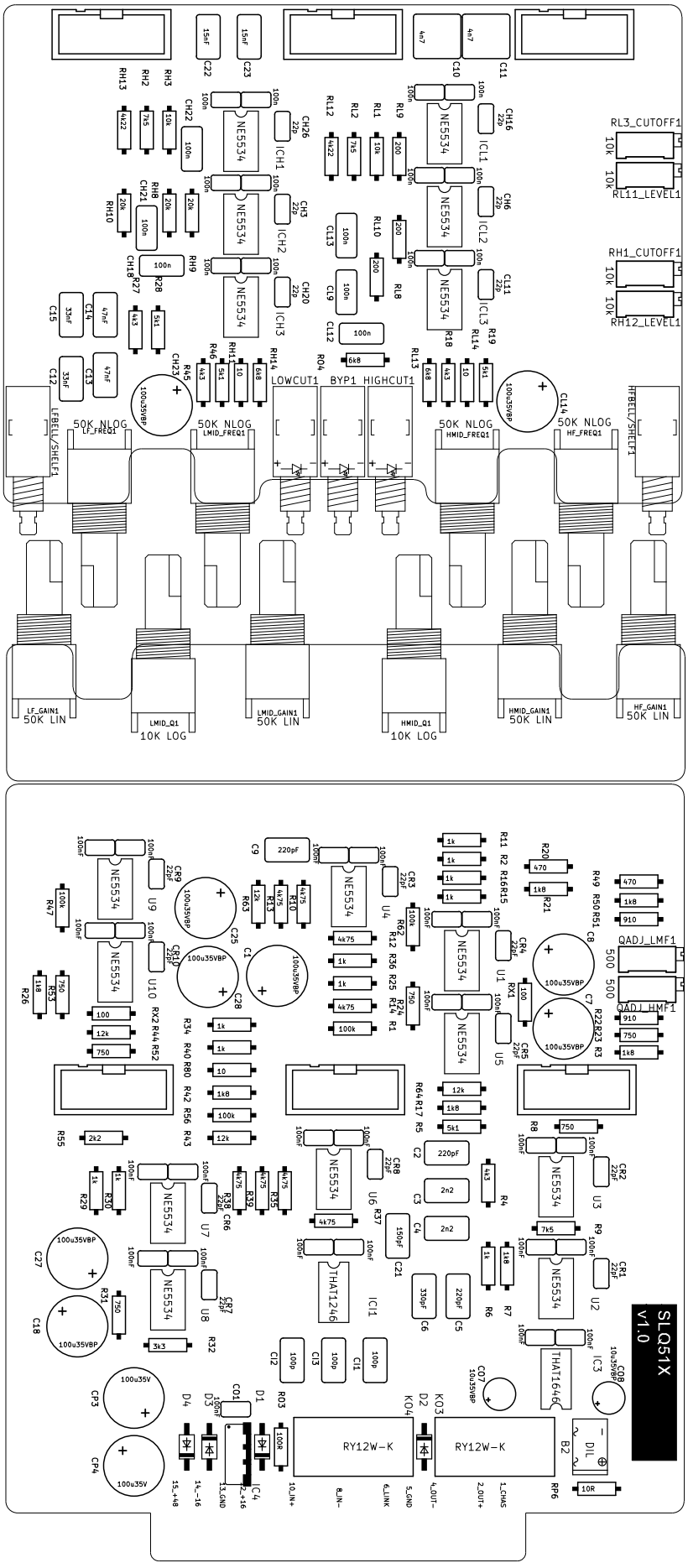
Calibrating HMF and LMF

Set the Oscillator frequency to 3kHz, switch the EQ section in with full HMF boost, and narrow ‚Q‘. All other gain controls should be set to their detent positions (flat). Adjust the frequency control until the output level peaks. At this frequency and ‚Q‘ setting the Boost/Cut control should give +15dB of gain. Set the **Q-Adjust trimmer** that you read a boost of +15dB. This should be set with the preset control marked **‚QADJ HMF‘**. Repeat the above at 1kHz for the LMF section using **‚QADJ LMF‘.** There is no adjustment for the HF or LF sections.

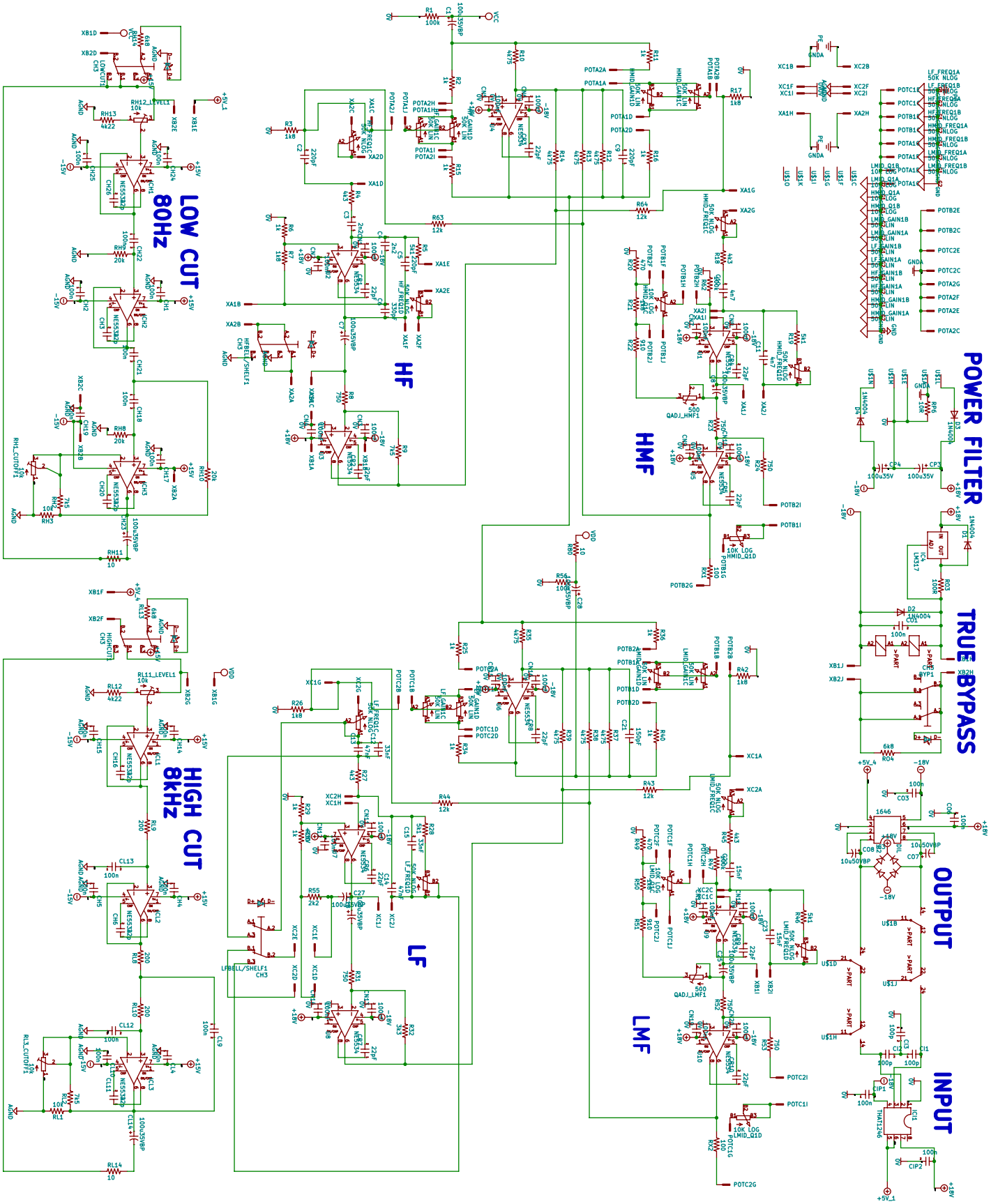
Calibrating LOW CUT and HIGH CUT

Set the Oscillator frequency to 1kHz. All gain controls should be set to their detent positions (flat). Enable LOW CUT Switch and read Level. Adjust **‚LC LEVEL‘** to the Same Level you reading without Low Cut enabled. Then Set the Oscillator frequency to 80Hz. Read the Level and then Adjust **‚LC CUTOFF‘** Trimmer. You should now read a -3dB drob at 80 Hz. Set the Oscillator frequency again to 1kHz and Adjust again Low Cut Level to the Same Level you reading without Low Cut enabled. After that Set the Oscillator frequency again to 80Hz and check if the drop is -3dB at 80Hz. Repeat this process until both conditions are set. When you‘ve done with Low Cut Repeatthis Process for High Cut, First 1Khz with **‚HC LEVEL‘** then 8 Khz and -3dB Drop with **‚HC CUTOFF‘**. Both Calibration need some time but if done, Congratulation to your SLQ51X !

PCB layout for reference



Shematics


LOW CUT
80Hz
HF
HMF
LF
LMF
HIGH CUT
8kHz
POWER FILTER
TRUE BYPASS
OUTPUT
INPUT

Bill of Materials (BOM)

ID	PART ON PCB	TYPE	COUNT	VALUE
1	RH11,RL14,R80,RP6	RESISTOR	4	10R
2	RX2,RX1,RO3	RESISTOR	3	100R
3	RL10,RL8,RL9	RESISTOR	3	200R
4	R20,R49	RESISTOR	2	470R
5	R31,R8,R24,R23,R53,R52	RESISTOR	6	750R
6	R22,R51	RESISTOR	2	910R
7	R29,R30,R36,R40,R2,R15,R6,R16,R11,R25,R34	RESISTOR	11	1k
8	R7,R3,R17,R21,R26,R42,R50	RESISTOR	7	1k8
9	R55	RESISTOR	1	2k2
10	R32	RESISTOR	1	3k3
11	RL12,RH13	RESISTOR	2	4k22
12	R18,R27,R45,R4	RESISTOR	4	4k3
13	R35,R38,R37,R39,R13,R14,R12,R10	RESISTOR	8	4k75
14	R28,R19,R46,R5	RESISTOR	4	5k1
15	RL13,RO4,RH14	RESISTOR	3	6k8
16	RH2,RL2,R9	RESISTOR	3	7k5
17	RH3,RL1	RESISTOR	2	10k
18	R44,R63,R64,R43	RESISTOR	4	12k
19	RH8,RH9,RH10	RESISTOR	3	20k
20	R1,R62,R56,R47	RESISTOR	4	100k
21	CN12,CN17,CN18,CN11,CN16,CN19,CN20,CN15,CN13,CN14,CN7,CN9,CN6,CN1,CN2,CN3,CN5,CN4,CN8,CN10,CO6,CIP1,CO3,CO1,CIP2,CH17,CH15,CH14,CH19,CL10,CL4,CH25,CH24,CH1,CH2,CH4,CH5	Ceramic 2,5MM	37	100nF
22	CR9,CR7,CR10,CR6,CR8,CR1,CR5,CR3,CR2,CR4,CH16,CH20,CL11,CH26,CH3,CH6	Ceramic 2,5MM	16	22pF
23	CH22,CH18,CH21,CL9,CL13,CL12	WIMA 5MM	6	100nF
24	C15,C12	WIMA 5MM	2	33nF
25	C13,C14	WIMA 5MM	2	47nF
26	C23,C22	WIMA 5MM	2	15nF
27	C21	WIMA 5MM	1	150pF
28	C6	WIMA 5MM	1	330pF
29	C2,C5,C9	WIMA 5MM	3	220pF
30	C4,C3	WIMA 5MM	2	2,2nF
31	CI1,CI3,CI2	WIMA 5MM	3	100pF
32	C10,C11	WIMA 5MM	2	4,7nF
33	CO7,CO8	Electrolyt	2	10u35VBP
34	CP3,CP4	Electrolyt	2	100u35V
35	C1,C25,C28	Electrolyt 16mm	3	100u35VBP
36	CH23,CL14,C18,C7,C8,C27	Electrolyt 20mm	6	100u35VBP

37	ICH3,ICL3,ICL1,ICL2,ICH1,ICH2,U9,U10,U2,U4,U3,U1,U5,U7,U6,U8	DIL08	16	NE5534AP
38	D1,D2,D3,D4	DO41-10	4	1N4007
39	ICI1	DIL08	1	THAT1246
40	IC3	DIL08	1	THAT1646
41	Sockets	DIL08	18	GS 8P
42	Bridge Rectifier	B-DIL	1	DIL
43	ON	Green LED	1	FLAT LED
44	HCUT,LCUT	Yellow LED	2	FLAT LED
45	KO4,KO3	RY12W-K	2	Relais
46	IC4	317TS	1	LM317
47	ALPS SWITCH	ALSP_2POL	5	Switch
48	Push Button Knob	KNOB	5	Knob
49	HF_FREQ,HMID_FREQ,LF_FREQ,LMID_FREQ	RK09L	4	50K NLOG
50	LMID_GAIN,HMID_GAIN,HF_GAIN,LF_GAIN	RK09L	4	50K LIN
51	HMID_Q1,LMID_Q1	RK09L	2	10K LOG
52	RH_LEVEL,RL_LEVEL,RH_CUTOFF,RL_CUTOFF	RTRIM64Z	4	10k
53	QADJ_HMF1,QADJ_LMF1	RTRIM64Z	2	500
54	KNOB	KNOB	10	Knob
55	KNOB CAP Green HMF	KNOB	3	Knobcap
56	KNOB CAP Blue LMF	KNOB	3	Knobcap
57	KNOB CAP Red HF	KNOB	2	Knobcap
58	KNOB CAP Orange LF	KNOB	2	Knobcap
59	Buscable	Buscable	3	Buscable
60	XA2,XB2,XC2,XC1,XA1,XB1	Pinheader	6	Buscable
61	POTC,POTB,POTA	Board Interconnect	3	Interconnect
63	Metalwork Frontpanel	Metalw. Frontpanel	1	Frontpanel
64	Metalwork Backpanel/Bracket	Metalw. Backpanel	1	Backpanel
65	25mm Spacer	Hardware	4	25mm Spacer
66	Screw M3	Hardware	8	Screw M3
67	Nut M3	Hardware	4	Nut M3
68	Spacer 0.145	Hardware	4	Spacer 0.145
69	Washer M7	Hardware	4	Washer M7
70	Nut M7	Hardware	4	Screw M7
71	Washer M9	Hardware	4	Washer M9
72	Nut M9	Hardware	4	Screw M9
73	Mainboard and two Subboards	PCB	1	PCBs