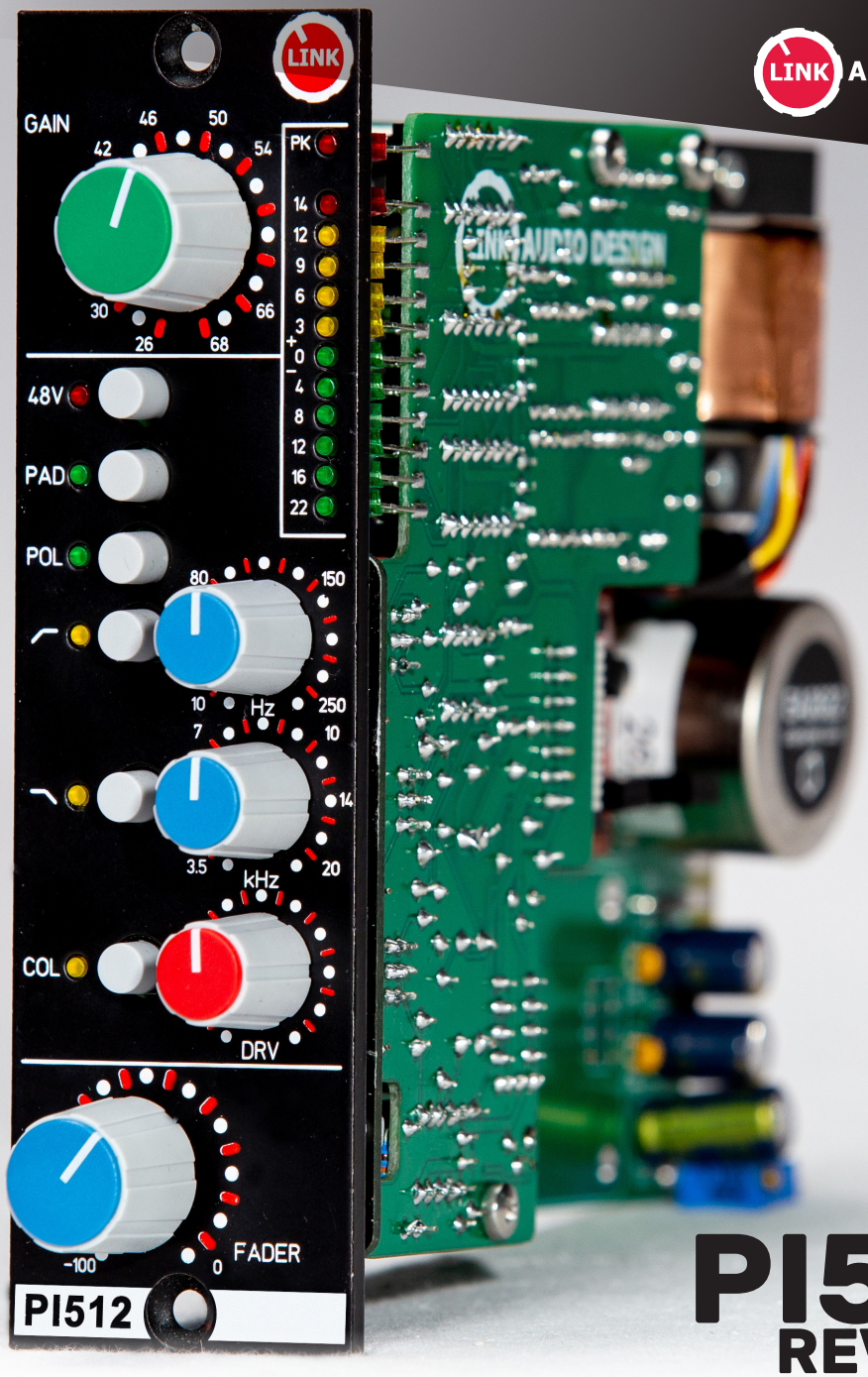


PI512
REV A

Introduction

Let me Introduce this nice Preamp in the Style of a American Console Preamp. I have designed this familiar Preamp in 500 API compatible Format. It works in 500 VPR or 51X Lunchboxes on the +16V and -16V rails. I mainly used the schematic of the 512 Preamp with Transformer Outputstage. In my Version I added variable High Pass and Low Pass Filters. For full flexibility in colouring sound with this Preamp Module we added the DIYRE Colour Module Standard. This Guide will help with setting up this nice Preamp. 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 Stepped Pot sets the amount of Mic-Gain achieved with the Preamp

This Switch enables Phantom Power

This Switch enables a 20dB PAD

This Switch changes the Polarity of the Output Signal

This Switch enables the High Pass Filter

This Switch enables the Low Pass Filter

This Switch enables the Colour Module

This Pot sets the Level of the Output Signal in a Range of -100dB to 0dB

The Peak LED is pre set to +18dBu directly after Preamp

The LED Meter can be set up PRE or POST FADER. Next to the Bus Cable of the LED Meter Board it can be Jumpered to the selected Feature. All the Levels are set in dBu

This Pot sets the Frequency of the Low Cut Filter in a range of 10 Hz to 250 Hz

This Pot sets the Frequency of the High Cut Filter in a range of 3.5kHz to 20 kHz

This Pot sets the amount of driving your Signal with the Colour Module

Internal the Output Ratio of the Transformer can set between 1:2 to 1:3 with Jumper near the Output

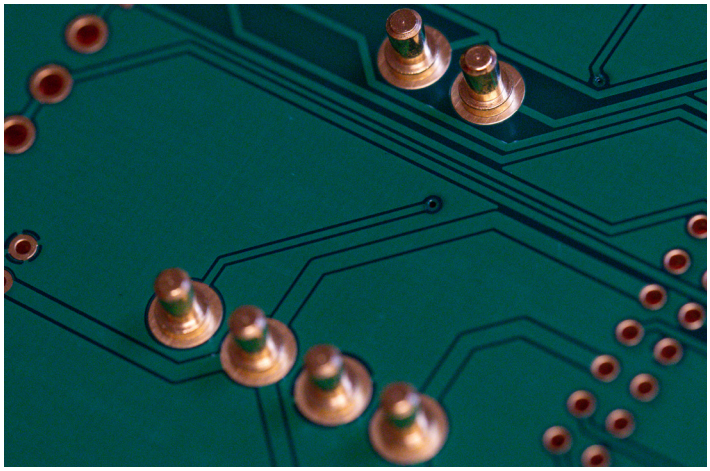
PAD Options

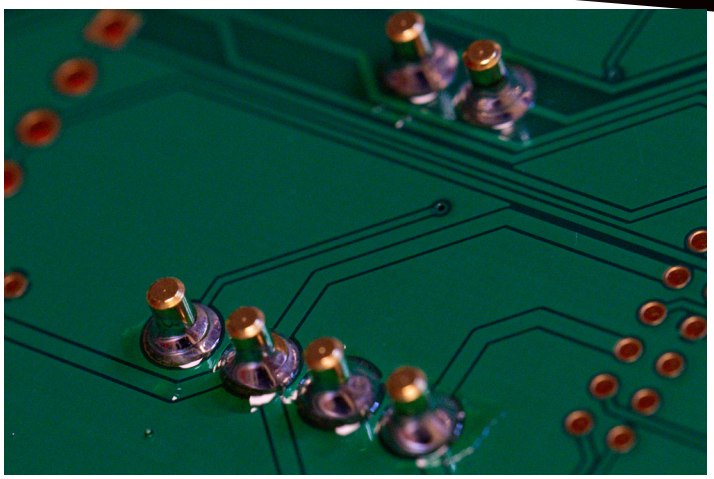
All the Pad-Resistors which are included in the Kit are selected like in the Original schematic. Due to many requests we show an option on how to mod the PAD switch to a Line- to Mic-Level Switch. The Impedance is more important for a Line Level Signal, so we choose two 5k1 Resistor as series Resistors and the Shunt Resistor has to be changed for the desired Level of Attentuation.
For using the Preamp in Line Mode we set it at a **GAIN SETTING of 42 dB**. In this Configuration. Line Level is at Unity at the In- and Output.

Resistor changes (Also Included in the Kit)
R_301 - 5k1
R_302 - 5k1
R_303 - 82R

Stuffing Boards

First we add the DOA Sockets to the Board. Place them from the back of the PCB and solder them in with enough solder.

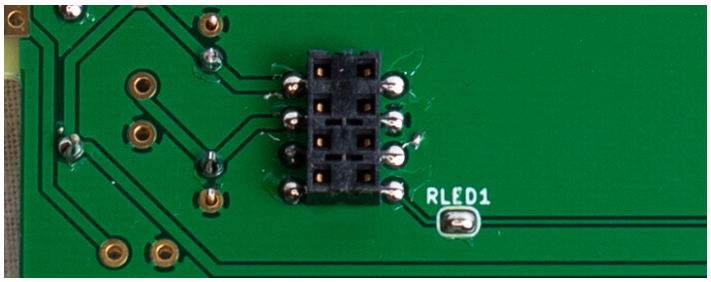




We need to choose if you want to use a Yellow LED or a RGB LED for the Colour Module. (Both LEDs included in the Kit)

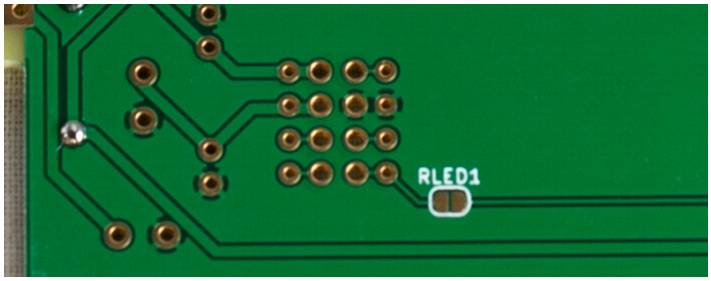
Using a RGB LED

Add a Small Solder Joint on the Back of the PCB near the Colour Module Connector. Don‘t use the 6K81/OPT Resistor called R_C_RGB1 on the Board. We will install the RGB LED later in the build process



Using a Yellow LED

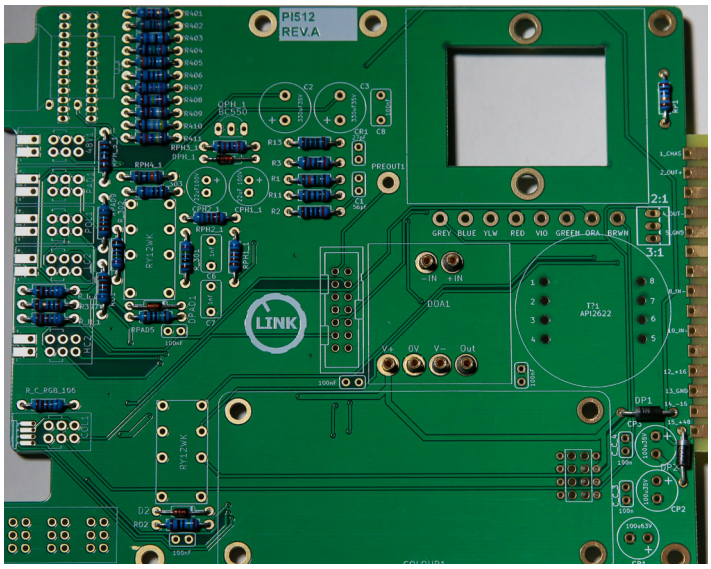
We don‘t add the Solder Joint on the back but we use the 6K81/OPT Resistor called R_C_RGB1 on the Board. We will install the Yellow LED later in the build process

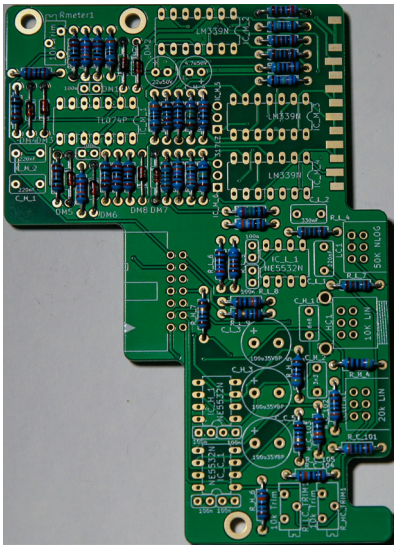


We will place Components on the Main Board and on the LED Meter Subboard. First Step is to place all Resistors and Diodes.

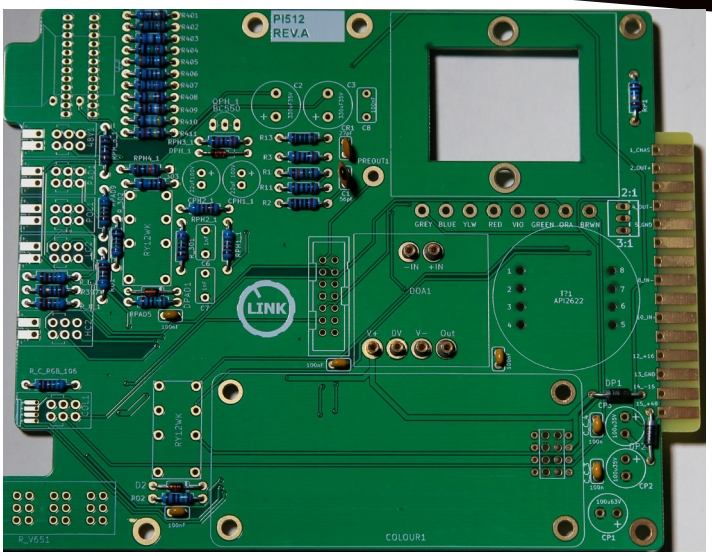
Change RM126 to 2k and RM127 to 1k, they are in the kit as well.

Check before Soldering if your Diode-Placement is right.

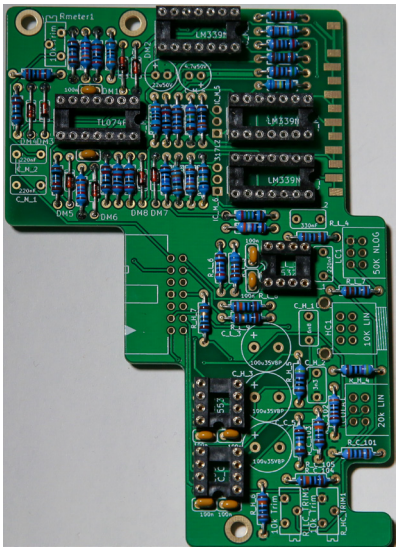




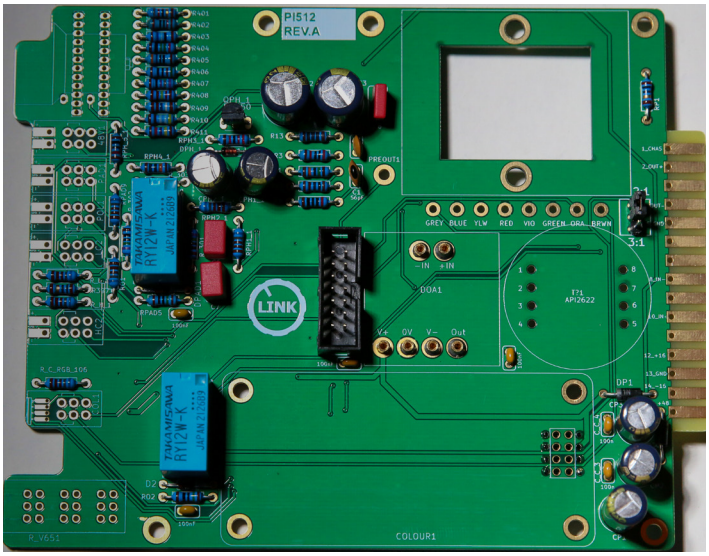
After Placing and Soldering all Resistors, we solder the next bigger parts like IC-Sockets and small capacitors, like Yellow 100nF and capacitors next to IC Sockets.



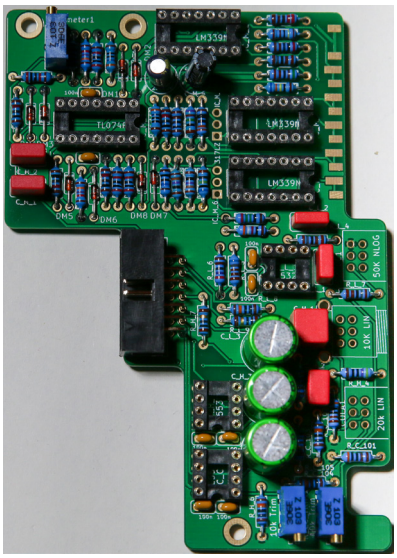
Continue on the LED Meter Board and add all Sockets. Normally we solder first one pin in and trim all of the other Pins as short as possible and continue after that with soldering all other pins on that Board.



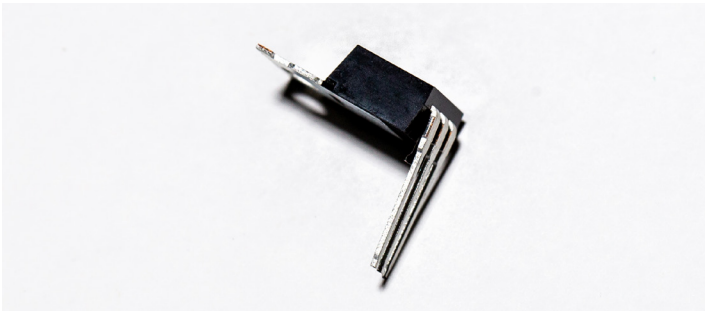
After that Step solder all Wima Capacitors, Electrolytics and Board Connectors as on the pictures.

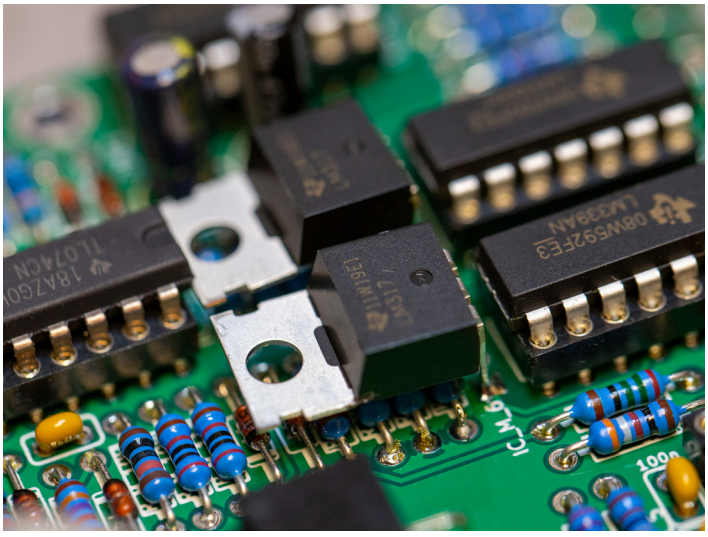


On the LED Meter Board we also add the electrolytics and Wima Capacitors and Board connections, and cut leads after soldering as short as possible. We will do this process later with Potentiometers also, since we need to make sure that this Preamp doesn‘t touch any neighbour modules of any kind.



Bend the LM317 and place them like in the pictures.





At this point we should clean our board and give the board and us a bigger break. Cleaning boards can be done with alcohol/water/your preferred method. But don‘t clean the Board after Trimpots, Switches and Pots are installed. Trimpots, Switches, Potentiometers don‘t like cleaning and that can lead to problems with electrical contact.

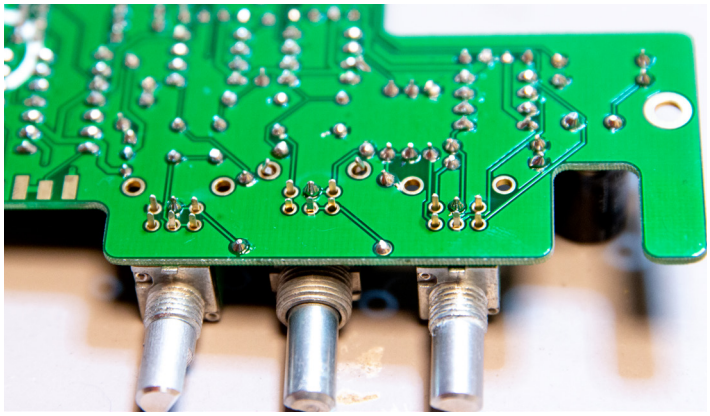
Potentiometers and Switches

Now we will continue with the LED Meter Board first. We add the three Potentiometers to their described positions.

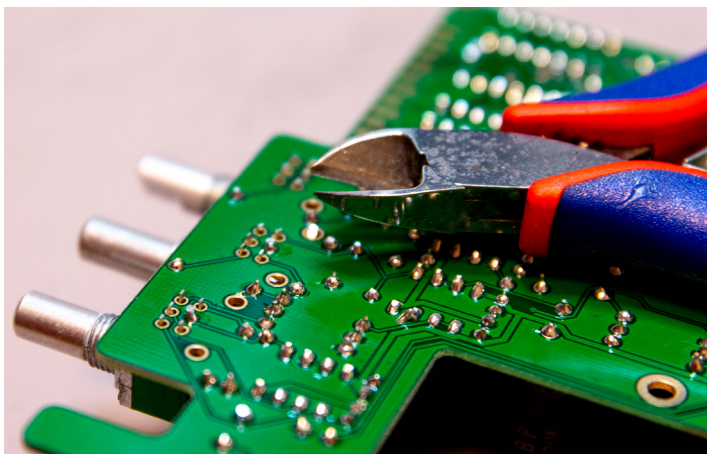
We have 3 different Potentiometers on the LED Board:
20K Linear (B20K) for Colour
10K Linear (B10K) for High Cut
50K Negative Logarithmic (C50K) for Low Cut

Main Board: T-Pad Output Pot - 6 Gang

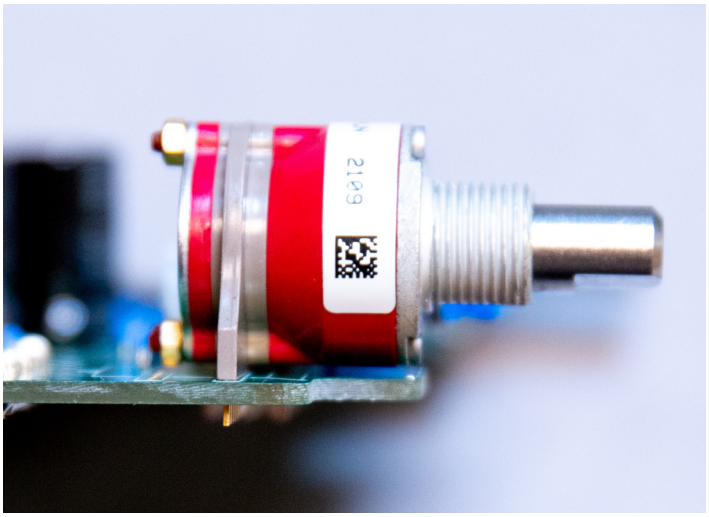
It is important to press them in place during Soldering, we need them to sit flush and straight because of the mechanical assembly later. Put all pots on the PCB and solder just one pin. After Soldering one Pin make sure the alignment of the pot is straight. You can check that with the printed silkscreen on the PCB. We don‘t solder the other Pins at this point to make a final alignment later on.

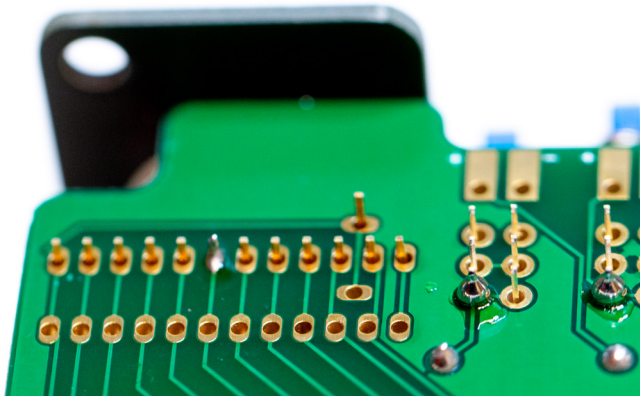


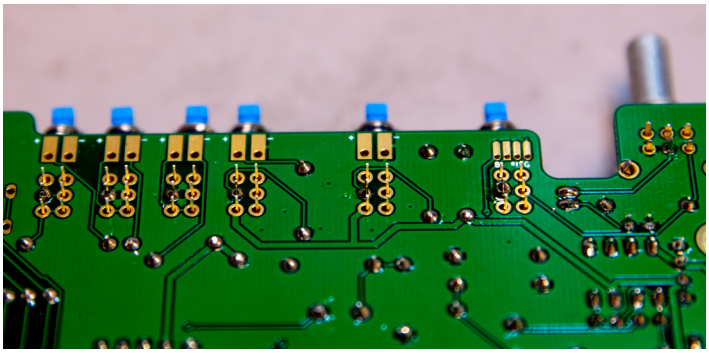
If not already done before we cut all leads on the upper subboard as short as possible.



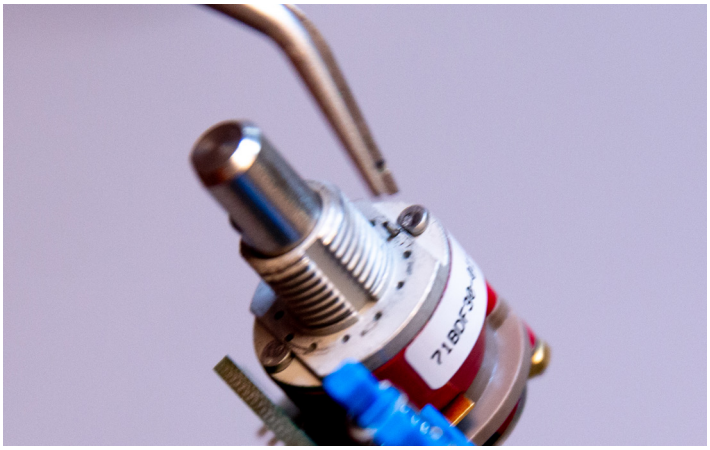
The next step is focusing on the Pot, Grayhill switch and Pushbutton Switches of the Mainboard. Again we will solder just one solder point of each part to bring the Pot/Switch in the right direction and will solder the rest of the Pins later on in the Final Assembly.

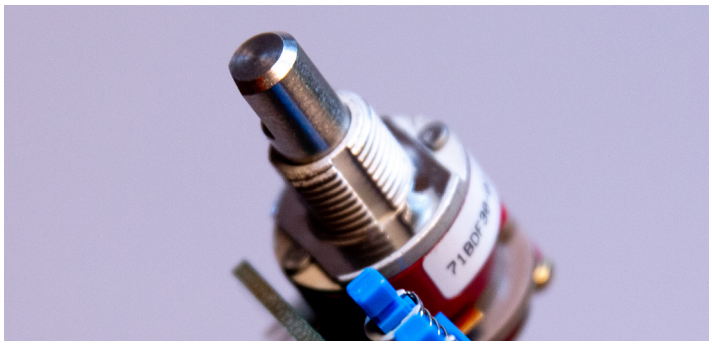




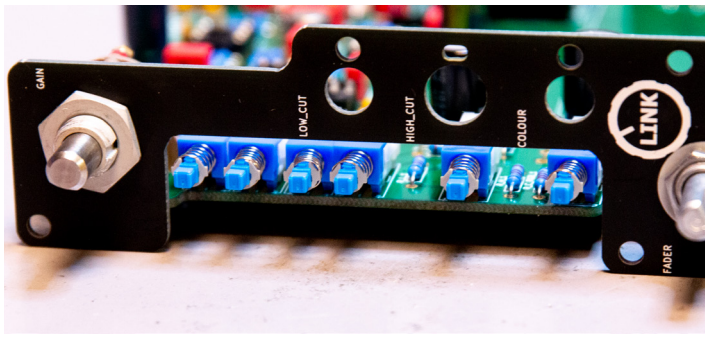


Now we will add one Stop Pin to the 12 o‘ clock Position of the Grayhill Switch and will tape the Switches Stop Pins with the Sticker so they can‘t move anymore.



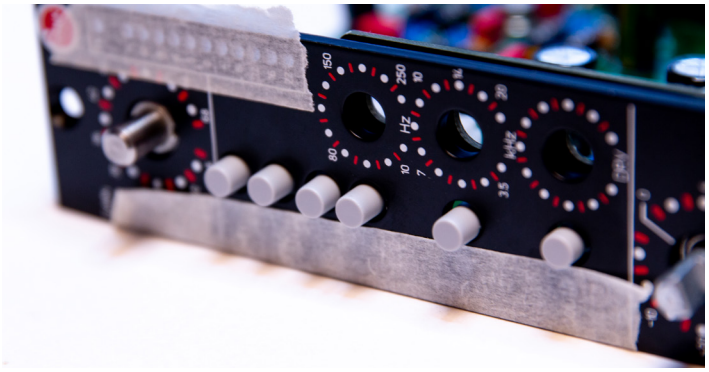


Check the alignment of the Switches and the Pots from upside again and try to align it to the silkscreen as good as possible. After that install the bracket on the Mainboard to make sure everything is in place.



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 just the Mainboard. You should use the nuts to screw them 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 in completly. After soldering in all of the Pots and Switches make sure that their leads are also trimmed short.

For the next Step we will use some paper masking tape to perfectly place all the LEDs. Place the tape just where the LEDs will be installed.



Now we will cut the LEDs legs. Make sure you have the right leg for + and - (Long leg is + and short leg is -). I usually don‘t cut them straigt and keep two different size legs, so you still know which leg is + and which is -. For the Mainboard we need LEDs with long leg measured cut to 8-10mm (5/16 to 6/16)

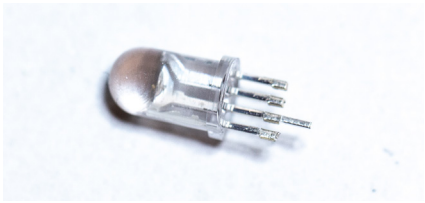
For the Mainboard we need:

1x RED
2x GREEN
2x YELLOW
1x RGB or YELLOW

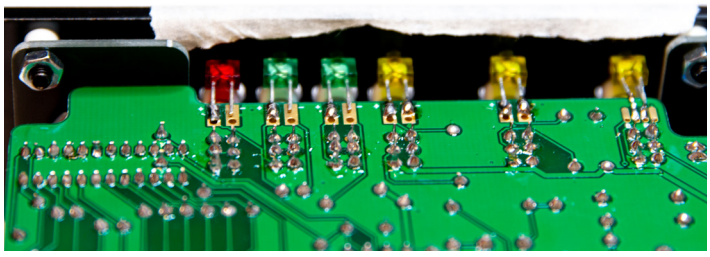
For the LED Meter we need LEDs with long leg measured cut to 12-14mm (8/16 to 9/16)

For LED-Meter we need:
2x RED
6x GREEN
4x YELLOW

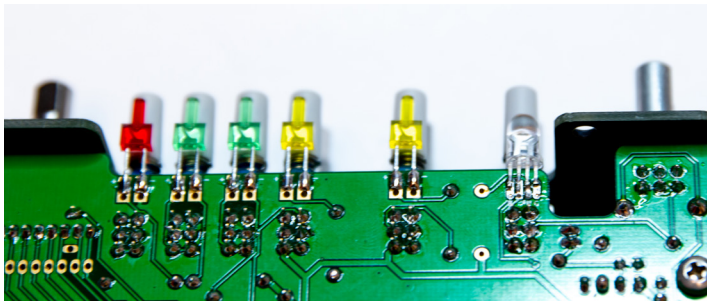
For the RGB LED I usually leave the Ground leg longer. that‘s also the longest leg before cutting.



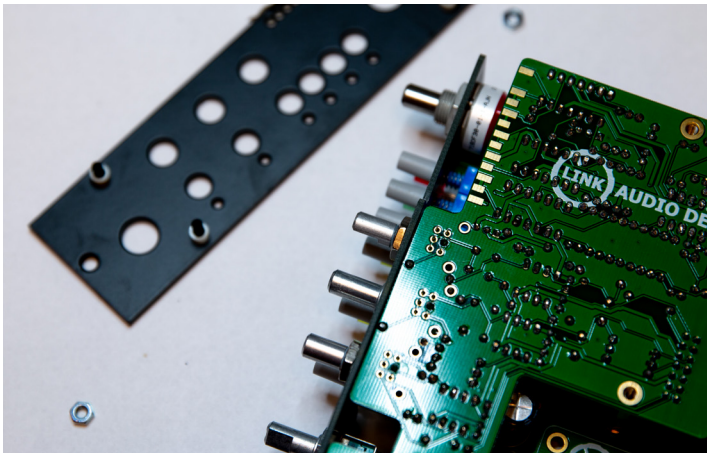
Make sure the LED is sitting flush with the frontpanel in one level. First solder one leg to make sure the LED is in place, then solder the other leg(s).



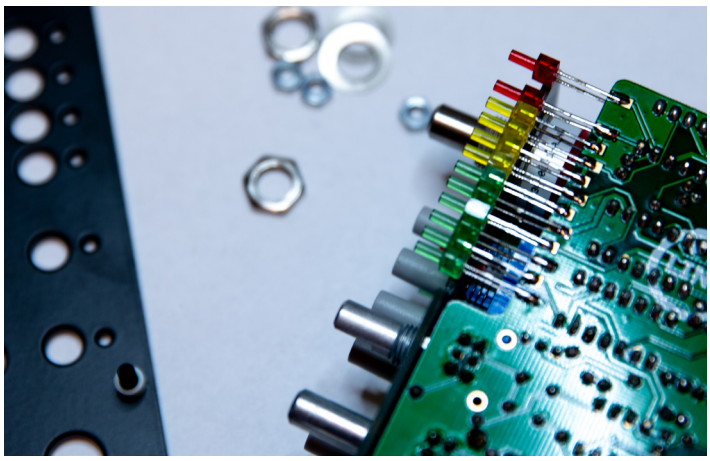
If you choose a yellow LED for Colour Module indication solder the long leg to R/Y and the short leg to the unlabeled Pin. If you want to solder RGB check the picture below.

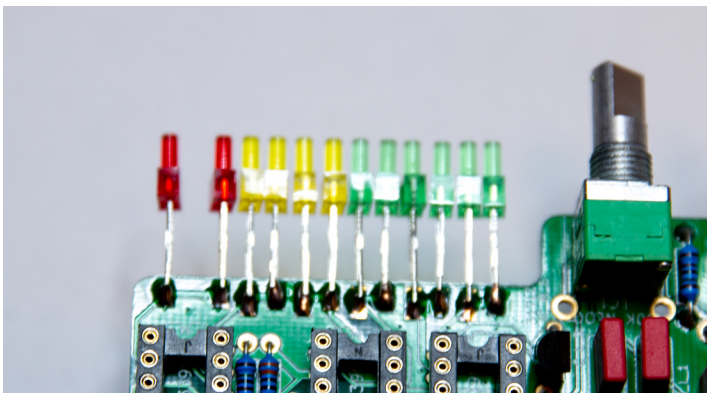


After soldering all LEDs tot the Mainboard unscrew the Frontpanel again. Put the 25mm Spacers on the Mainboard and add the LED-Meter Board. Use the screws to secure the LED-Meter Board. Put the Frontpanel back on again and tighten the Nuts to the bracket. Now we will finally solder the remaining legs of the Pots as they should be perfectly centered now.



After that we will install all of the Meter LEDs. The Meter-LEDs Solder Points have short and long dashes. A long dash is + and is meant for the long leg of the LED. Short dash means - and the short leg of the LED. Add all LEDs step by step and solder them all just from the top. After installing all LEDs remove the Frontpanel again and Solder all points from the backside of the LED-Meter Board.

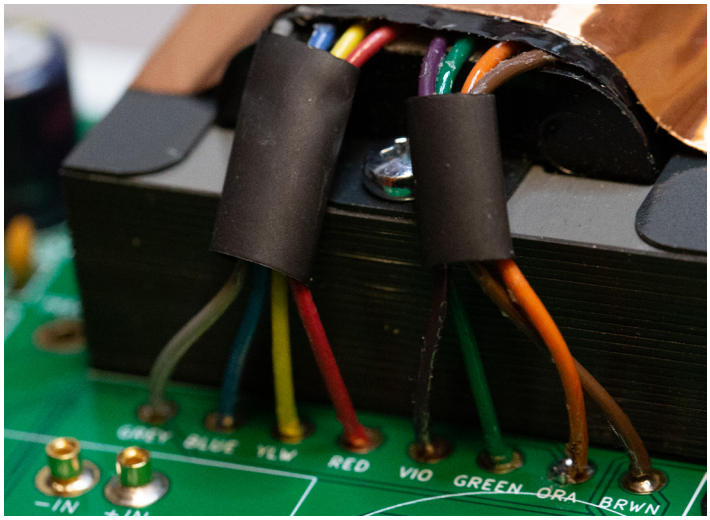


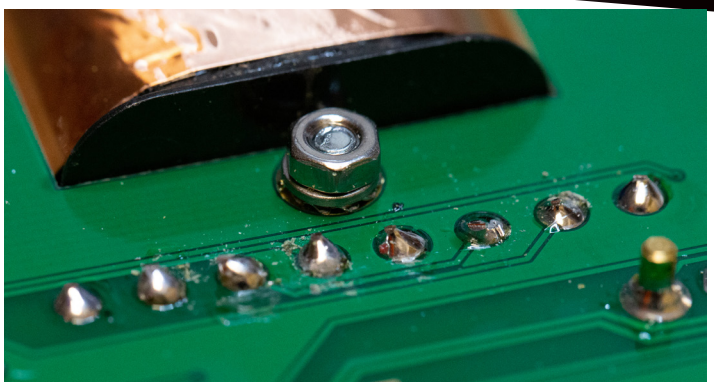


Transformer Assembly

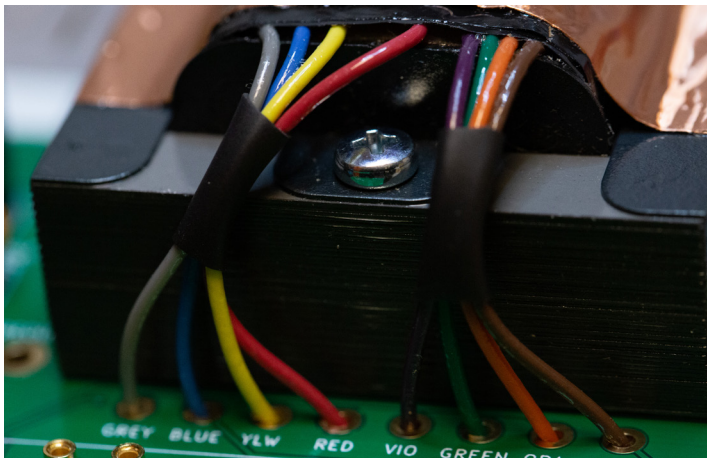
Use the long Screws and Washers to get your Output Transformer on the Mainboard. Use the Nut on the Bottom of the PCB

Use some heatshrink (not included in the kit) for four cables and wire each cable to the corresponding hole. You can cute the leads on the bottom of the PCB, holes are big enough for cables with isolation. On the bottom I cut them 10mm or 1/2“ and use my solder Iron and fingers to get the isolation away. Then I solder all wires on the bottom of the PCB.





Once done, trim the leads and shrink the heat shrink with some hot air.



Place the Input Transformer with a gap between PCB and transformer. You can use a space or just solder one pin and later the other pins.

Final Assembly

Now we have soldered all parts and want to check without the IC and Opamps installed if the voltages are right.

For that we don‘t use the Frontpanel or the bracket. We use the ribbon cables to connect the boards. Use an adapter for your lunchbox/or power it up on another way to measure all Voltages near the ICs. The Voltage Meter should show something like +/-15,3V, because of the drop of the diodes at the power input. Check also if the LEDs on the switches are working and the relais are switching.

There is the DOA Socket for different Voltages on the Board. The Circuit uses different Voltages. So you should read labels and corresponding Voltage. Then we head over to each special IC and measure if all Voltages are alright.

TL074 PIN4:+15,3V PIN11:-15,3V
LM339 PIN3:+15,3V PIN12:-15,3V
NE5532 PIN8:+15,3V PIN4:-15,3V

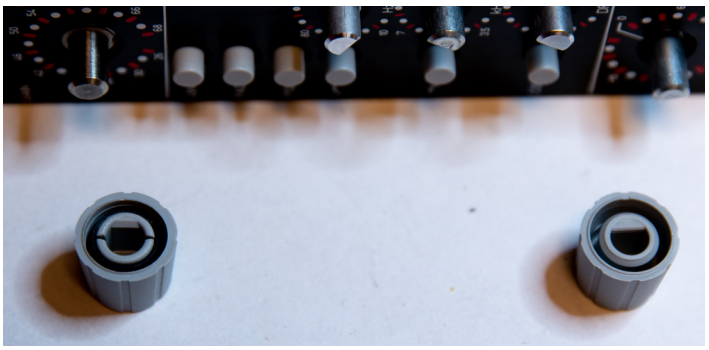
If everything seems good install the ICs. Check the Orientation of each IC before installing. Check the Datasheets of NE5532, TL074, LM339 to find the Input Pins where the Opamps get their Voltage and make sure everything is in place.

First we use the bracket to install the mainboard with the M7 nuts for the Pots. Then check all ICs for the right orientation again. Next put all the ribbon cables on the mainboard.

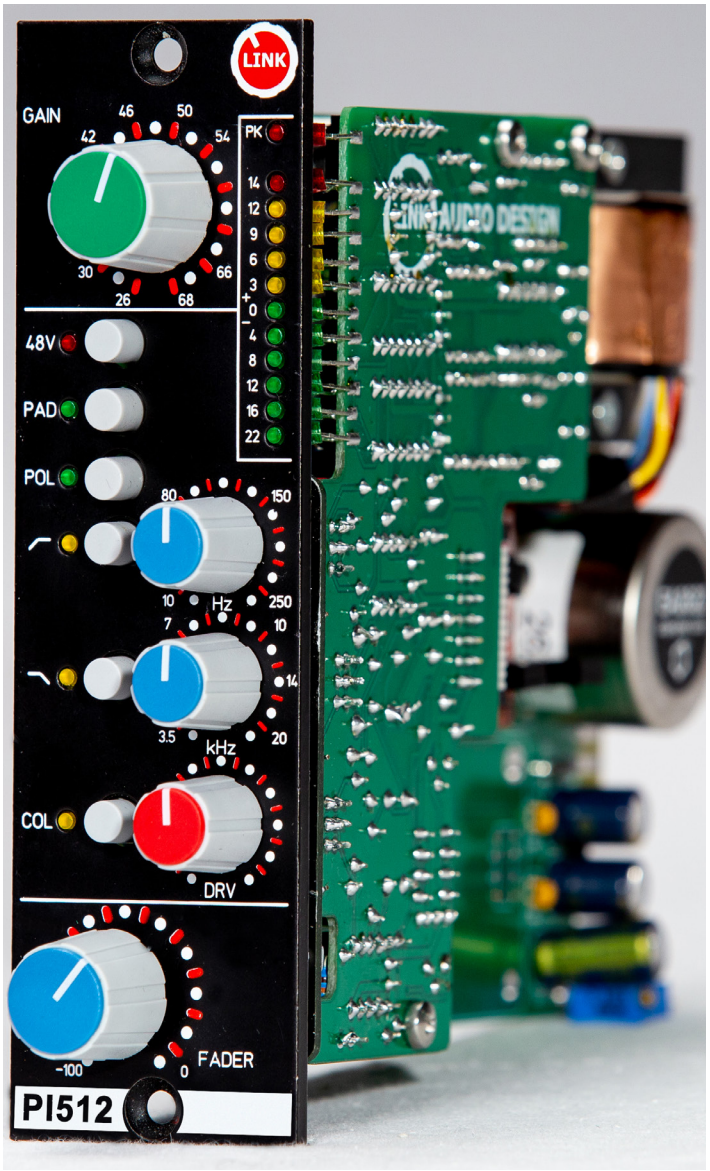
Now we install the upper subboard by holding it angled and connect the ribbon cables at the same time. Add the nuts for the M7 Pots. Now we add the 25mm Spacers between the two boards and screw them together.

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

11mm Blue - High Cut and Low Cut Filters
11mm Red - Colour Module
15mm (6mm Shaft) Blue - Output Fader
15mm (1/4“ Shaft) Yellow - Gain



After finishing try to run Audio through the unit. If that works we need to Calibrate the unit later on.



Calibration

Calibration of this unit is no Rocket Science and it‘s quite easy. You need to playback different Sinus and Noise signals in different levels and frequencies. Make sure you have enough headroom that you don‘t get clipping when capturing the response of the Preamp. I try to have at least 10dB headroom before my interface clips. That Calibration works with every DAW but the easiest way to calibrate this EQ is using the freeware sofware REW(Room EQ Wizard).

First of all we need a constant reference level, I use the Software REW. I calibrated my Output Measure signal to +6dBU as my maximum output and Input, you should read on your multimeter 1,545Volts. My reference Sine signal for the preamp is set at -40dBU. The Voltage equilvalent on your multimeter should be 0,007Volts. I switch in REW for a better Overview to dBFS scaling.

To calibrate your Measuring System and learning about levels I highly recommend. The Setup of REW by DIYRE (3 parts on Youtube):

https://www.youtube.com/watch?v=OwwKV-4QTfwU

To calculate levels i use the Calculator of Sengpiel:

http://www.sengpielaudio.com/Rechner-db-volt.htm

Testing the Unit

- All Switches Off
- Gain at lowest setting
- Output Fader at 0
- Send a constant White Noise signal through the unit at -40dBu,
- Set the gain to good starting level that you can check if all functions work,
- check Low Cut and High Cut
- Check PAD and POL functions
- Check 48V only with phantom power device connected (microphones/ active di boxes)
- You can check that with a scope, in REW or by hearing on a control system if the unit changes the sound
- If all of the above mentioned conditions are set we can calibrate the unit

LED Meter Calibration

- All Switches Off
- Gain at lowest setting
- Output Fader at 0
- Set the Oscillator frequency to 1kHz (-40dBU)
- Adjust Gain of the preamp and Output level of your reference signal until you read with your Multimeter 1,554Volts AC between PREOUT1 and GND
- Set the **R_meter1** that all green LEDs of the LED Meter light up.

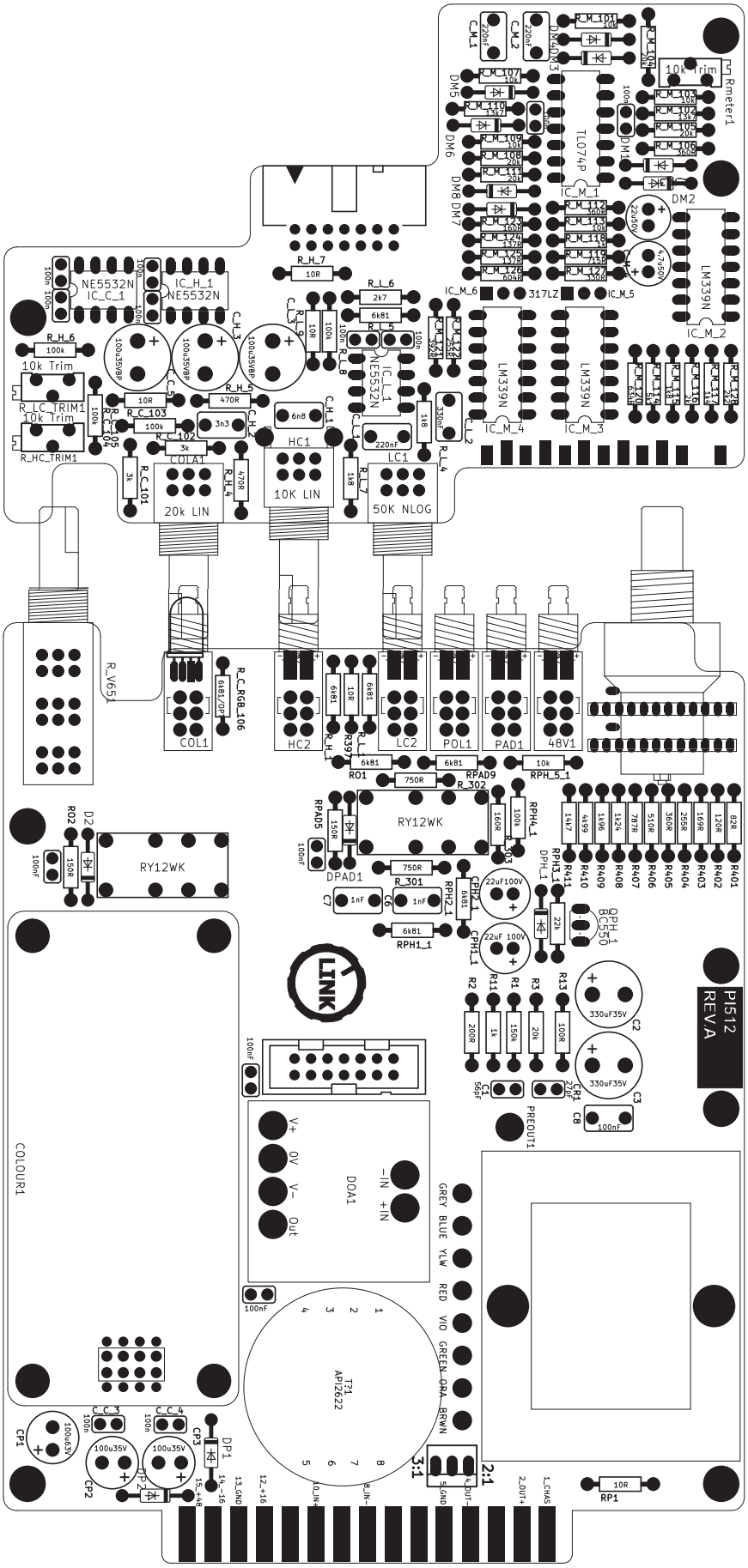
Low Cut Calibration

- All Switches Off
- Gain at lowest setting
- Output Fader at 0
- Set the Oscillator frequency to 1kHz (-40dBU)
- Adjust Gain of the preamp and Output level of your reference signal until you read with your Multimeter 1,554Volts AC between PREOUT1 and GND
- note that level in your measuring system
- Switch Low Cut on
- Set the **R_LC_TRIM** that you read also same level without Low Cut engageged in your measuring system (Not at PREOUT1)

High Cut Calibration

- All Switches Off
- Gain at lowest setting
- Output Fader at 0
- Set the Oscillator frequency to 1kHz (-40dBU)
- Adjust Gain of the preamp and Output level of your reference signal until you read with your Multimeter 1,554Volts AC between PREOUT1 and GND
- note that level in your measuring system
- Switch High Cut on
- Set the **R_HC_TRIM** that you read also same level without High Cut engageged in your measuring system (Not at PREOUT1)

PCB layout for reference



ID	PART ON PCB	TYPE	COUNT	VALUE
1	R_C_103,R_H_6,R_L_8,R_C_104,RPH4_1	Resistor	5	100k
2	R13	Resistor	1	100R
3	R_M_107,R_M_113,R_M_101,R_M_103,R_M_109,RPH_5_1	Resistor	6	10k
4	R_C_105,R_H_7,R_L_9,R397,RP1	Resistor	5	10R
5	R402	Resistor	1	120R
6	R_M_124,R_M_125	Resistor	2	137R
7	R_M_110,R_M_102	Resistor	2	13k7
8	R411	Resistor	1	14k7
9	R1	Resistor	1	150k
10	RPAD5,RO2	Resistor	2	150R
11	R_M_123,R_303	Resistor	2	160R
12	R403	Resistor	1	169R
13	R_M_118,R11	Resistor	2	1k
14	R408	Resistor	1	1k24
15	R_M_117	Resistor	1	1k4
16	R_M_128	Resistor	1	1k5
17	R_M_115	Resistor	1	1k78
18	R_L_4,R_L_7	Resistor	2	1k8
19	R409	Resistor	1	1k96
20	R2	Resistor	1	200R
21	R_M_105,R_M_108,R_M_111,R_M_104,R3	Resistor	5	20k
22	RPH3_1	Resistor	1	22k
23	R_M_122,R404	Resistor	2	255R
24	R_M_116	Resistor	1	2k
25	R_L_6	Resistor	1	2k7
26	R_M_127 (change to 1k)	Resistor	1	1k (not 330R)
27	R_M_112,R_M_106,R405	Resistor	3	360R
28	R_M_121	Resistor	1	392R
29	R_C_102,R_C_101	Resistor	2	3k
30	R_H_4,R_H_5	Resistor	2	470R
31	R410	Resistor	1	4k99
32	R406	Resistor	1	510R
33	R_M_114	Resistor	1	5k1
34	R_M_126 (change to 2k)	Resistor	1	2k (not 604R)
35	R_M_120	Resistor	1	634R
36	R_L_5,RPAD9,RO1,RPH2_1,R_H_1,RPH1_1,R_L_1	Resistor	7	6k81
37	R_C_RGB_106	Resistor	1	6k81/OPT
38	R_M_119	Resistor	1	715R
39	R_302,R_301	Resistor	2	750R

ID	PART ON PCB	TYPE	COUNT	VALUE
40	R407	Resistor	1	787R
41	R401	Resistor	1	82R
42	DP1,DP2	Diode	2	1N4004
43	DPAD1,DPH_1,D2,DM2,DM8,DM5,DM3,DM4,DM7,DM6,DM1	Diode	11	1N4148
44	C_C_2,C_M_6,C_M_5,C_H_4,C_L_4,C_L_5,C_H_5,C_C_1,C_C_3,C_C_4,C5,C4,C_PAD1,CO1	Ceramic 2,5mm	14	100nF
45	C1	Kerko 2,5mm	1	56pF
46	CR1	Kerko 2,5mm	1	27pF
47	C_L_2	Wima 5mm	1	330nF
48	C_H_1	Wima 5mm	1	6n8
49	C_L_1,C_M_1,C_M_2	Wima 5mm	3	220nF
50	C_H_2	Wima 5mm	1	3n3
51	C8	Wima 5mm	1	100nF
52	C7,C6	Wima 5mm	2	1nF
53	C_M_3	Electrolytic	1	22u50V
54	C_M_4	Electrolytic	1	4.7u50V
55	CPH1_1	Electrolytic	1	22uF 100V
56	CPH2_1	Electrolytic	1	22uF100V
57	CP2,CP3	Electrolytic	2	100u35V
58	CP1	Electrolytic	1	100u63V
59	C3,C2	Electrolytic	2	330uF35V
60	C_C_5,C_L_3,C_H_3	Electrolytic Bi-polar	3	100u35VBP
61	KPOL1,KPAD1	Relais	2	RY12WK
62	COL1,48V1,LC2,POL1,HC2,PAD1	Switch	6	ALPS_SPUJI_2
63	Socket GS8	Socket Opamp	7	Socket GS8
64	Socket GS14	Socket Opamp	4	Socket GS14
65	DOA1	Sockets	6	2520 Sockets
66	IC_C_1,IC_L_1,IC_H_1	Opamp	3	NE5532A
67	IC_M_1	Opamp	1	TL074P
68	IC_M_2,IC_M_4,IC_M_3	Comparator	3	LM339N
69	COLOUR1	Connector	1	SAMTEC CON
70	IC_M_6,IC_M_5	Regulator	2	LM317
71	QPH_1	Transistor	1	BC550

ID	PART ON PCB	TYPE	COUNT	VALUE
72	RGB_LED1	LED	1	RGB_LED
73	LED_M_1-6, LED PAD+POL	LED	8	LED_GREEN
74	LED_M_7-10,LED_HCUT_LCUT_COL	LED	7	LED_YELLOW
75	LED_M_11-12,LED_48V	LED	3	LED_RED
77	X3	Connector	1	2514-straight
78	X4	Connector	1	2514-angled
79	Buscable	Cable	1	14 pol Buscable
80	HC1	Potentiometer	1	10K LIN (B10K)
81	COLA1	Potentiometer	1	20k LIN (B20K)
82	LC1	Potentiometer	1	50K NLOG (C50K)
83	RV1	Potentiometer	1	R_V65_1k
84	R_HC_TRIM1,Rmeter1,R_LC_TRIM1	Trimmer	3	10k Trim
85	DI25	Spacer	3	DI25
86	M3 Screw	Screw	6	M3 Screw
87	m7	Nut	3	M7 NUT
88	m7 washer	Washer	3	M7 washer
89	M3 Nut	Nut	3	M3 Nut
90	distance spacer	Spacer	3	Distance spacer Frontpanel
91	U$2	Switch	1	GRAYHIL_SIN-GLE
92	TR1	2503	1	EA2503
93	T?1	2622	1	LX7510
94	LED_PCB	PCB	1	LED_PCB
95	Bracket_PCB	PCB	1	Bracket_PCB
96	Frontpanel	Frontpanel	1	Frontpanel
97	PCB	PCB	1	PCB
98	Switch Caps	Switch Caps	6	Switch Caps
99	11mm knob	Knob	3	11mm knob
100	11mm blue cap	Colour Insert	2	11mm blue cap
101	11mm red cap	Colour Insert	1	11mm red cap
102	15mm 6,35 knob	Knob	1	15mm 6,35 knob
103	15mm 6mm dhshaft knob	Knob	1	15mm 6mm knob
104	15mm green cap	Colour Insert	1	15mm green cap
105	15mm blue cap	Colour Insert	1	15mm blue cap
106	METERSELECT	Pin Header	1	Pin Header
107	METERSELECT	Jumper	1	Jumper