Foreword

Dear tubes friend,

Thank you for purchasing this state-of-the-art Audio Analyzer DIY kit for 6 x EM800 Magic Eye tubes. You have purchased a product that captivates as a DIY version a component quality and choice of materials that is outstanding in the market and will certainly draw the attention as an eye catcher of your acquaintances in the future.

However, this also means that you should not "cobble together" this kit in record time. Take a quiet evening and about three hours time to build.
Also you should already have the necessary equipment and knowledge to be able to build such a high-quality DIY kit without complications. The resulting success will definitely reward you for your effort and stamina.

This instructions assume electronic fundamentals, i.e. you should already know that Electrolythic Capacitors, ICs, LEDs and Transistors are polarized components and may not be soldered in reverse direction. These parts are also very sensitive for electrostatic discharge. Furthermore, the usage of a temperature-controlled soldering station with max. 1 mm wide tip and corresponding fine electronic solder as well as appropriate tools (multimeter, TX10, PH1/2 and mini slotted screwdriver, side cutter, tweezers, magnifying glass, etc.) are recommended.

Please follow the steps and hints in this manual. These are all tested and allow you a trouble-free assembly.

Important Safety Instructions

During installation, commissioning and measurements and repair special care is required! Assembling of the circuit is at your own risk. The functionality can not be guaranteed, nor the suitability for certain purposes. The user himself has to check this and is responsible for this suitability.

No liability can be accepted for damages arising during or as a result of the assembly or operation, in particular for damages resulting from a lack of electronic skills.

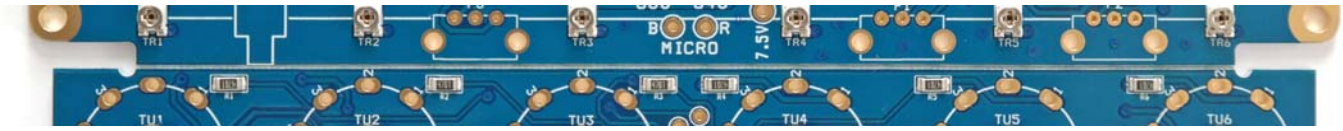
The Analyzer may only be operated in a touch-proof housing in dry indoor enviroment. Operation without or with defective tubes is not permitted!

The person who has completed a kit or has made an assembly ready by extension or encolure installation, is according to VDE 0869 a manufacturer and therefore provided to supply all documents when selling the device and also give his name and address.

Devices which are assembled from kits themselves are to be considered as an industrial product in terms of safety.

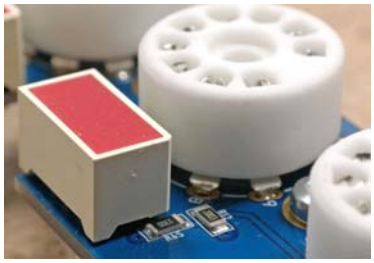
And now, after these necessary words - fire up your soldering station ...

Please crack first carefully both PCBs (tubes and main board) at the „V-cut“ line.



Assemble at the **very first task** the red male header on the tube board **fitted on solder side**. Next assemble the six Noval tube sockets (Tip: For easier fixing solder one pad from each socket first from components side).

Following fix the four metal spacers with 4 x M3 x 4 screws.



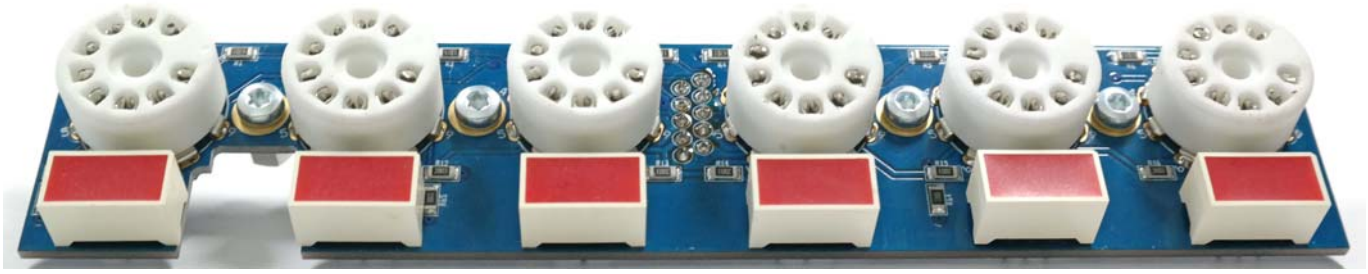
Only on Mr.Nixie version:

Assemble the six red bargraph LEDs.
The right hand upper edge of the package of LED @ 150 Hz needs to be cutted because of too less spacing to a resistor.

Nozzle on male header

Metal spacer fitting

Di M3 x 6 Di M3 x 12 Di M3 x 12 Di M3 x 6



Mr.Nixie version

Jan Wüsten version

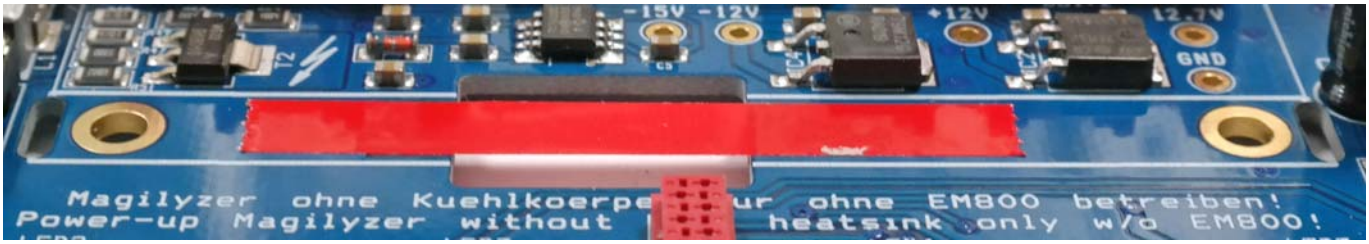
Note: The following illustration refers to the Mr.Nixie version, which is identical to the Jan Wüsten version except for the additional six red bargraph LEDs on the tube board.

We will now start assembling the main board in the following order:

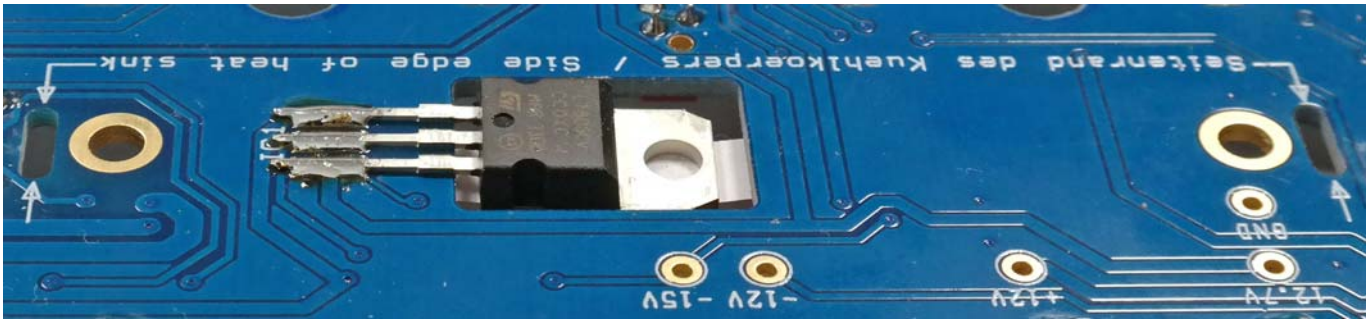
- 8-pol. IC socket. Take special care for correct orientation of the notch.
  Do not assemble the NE555 (IC12) yet!
- 10-pol. female header, take also care for the notch at the drill hole's position on the board.
- DC-jack – Expediently solder on pin on component side for fixing the jack.
- 3 x ALPS mini slider potentiometers, check for proper alignement and solder also the metal bezel of the potentiometer.
- Power switch and knob.
- 10 x Electrolythic Capacitor 22µF and 1 x 330µF.
- 2 x stereo RCA jacks.
- Elektret microphone with connection wires.

Assembling the L7808CV voltage regulator

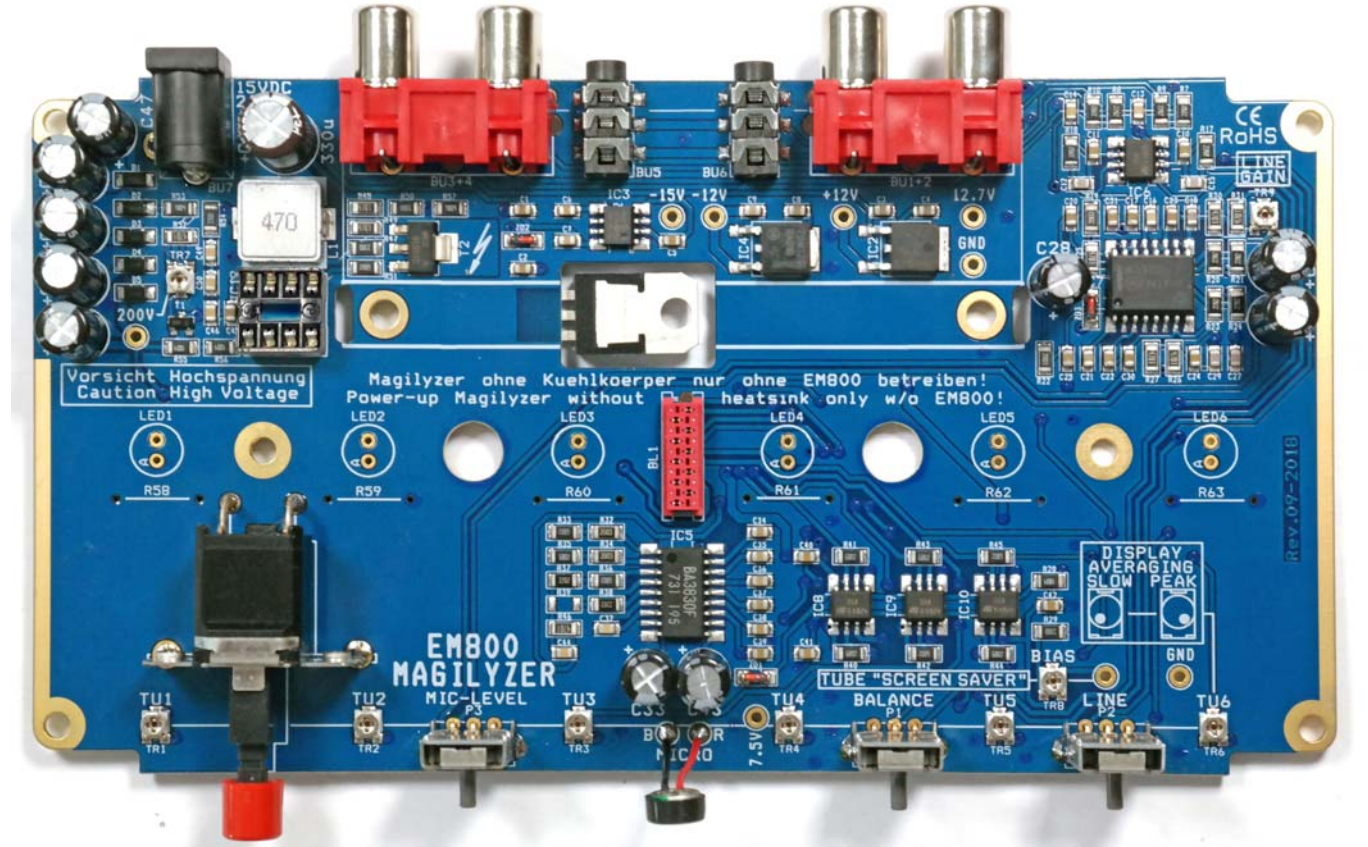
Fit a piece of adhesive tape on component side over the cutout



Flip the PCB and solder the voltage regulator exact in the middle of the cutout.

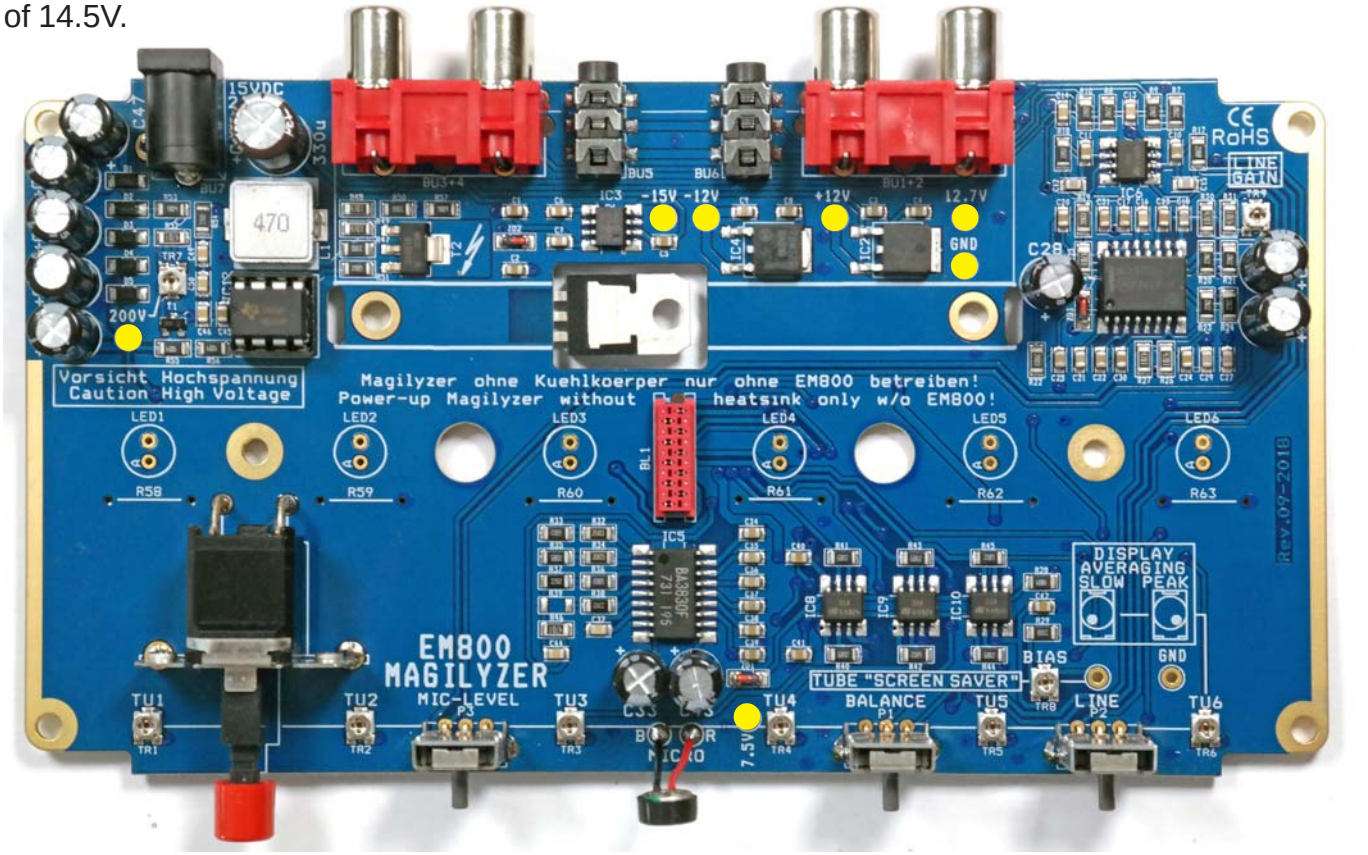


Remove the adhesive tape.



Checking of the generated voltages

Connect the main PCB to the supplied 15VDC PS and turn the device on. Wait a lille bit. Nothing may become warm or even hot. **The NE555 (IC12) is still not fitted yet!**
Check with a multimeter the voltages -15V, -12V, +12V, 12.7V and 7.5V vs. GND.
The reading should be within a 5% tolerance range.
Check the 200V voltage. As the NE555 is not fitted yet, the voltage reading should be in the range of 14.5V.

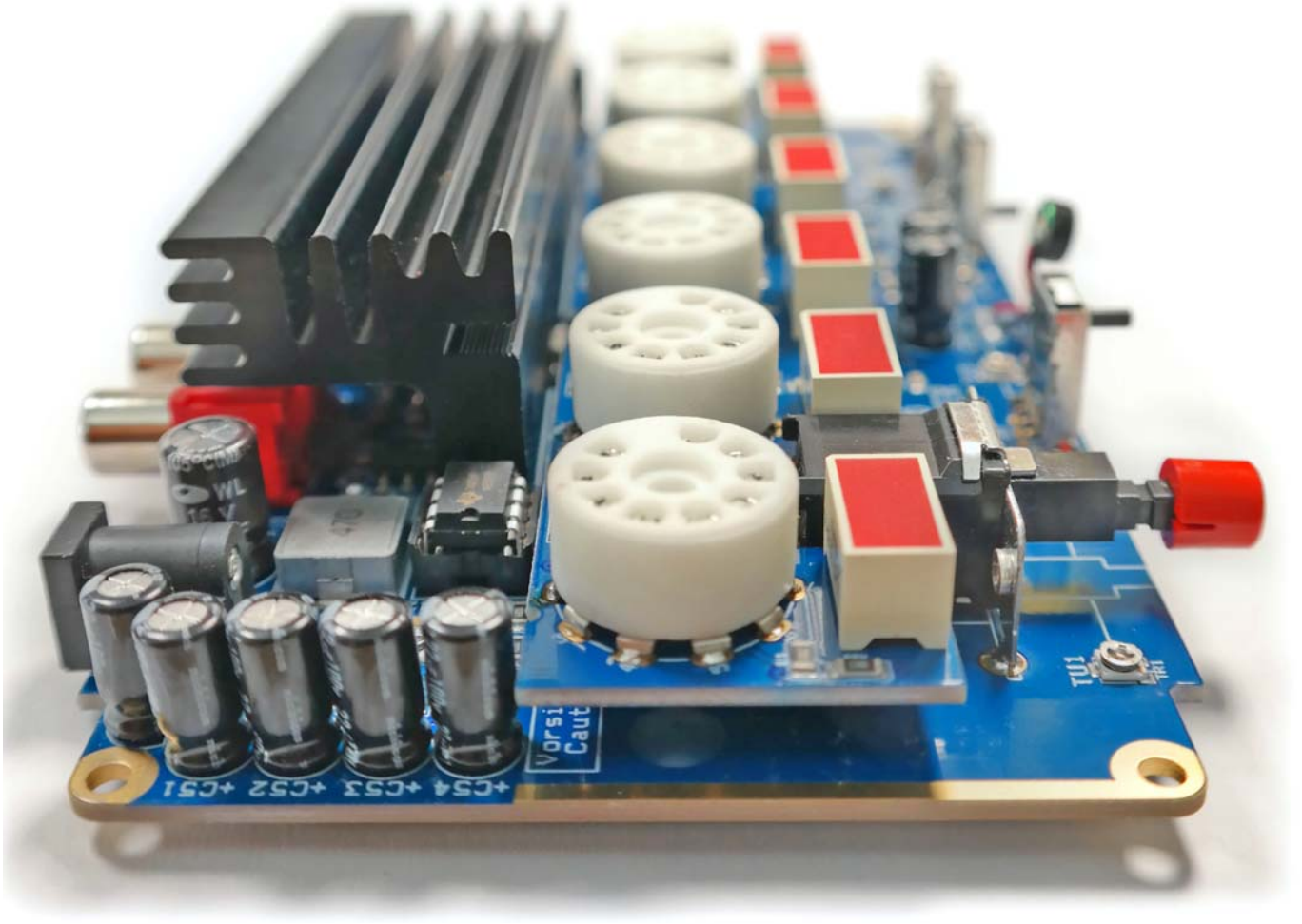


When everything is ok, turn off the Analyzer and **fit after a short waiting period the NE555 (IC12)** into its socket. Turn on again the Analyzer.

Caution, high voltage is now present on the board!

Check again the 200V voltage and adjust the value with trimmer potentiometer and an **isolated** mini slotted screw driver to 180V...200V. This trimmer is very touch sensitive!
After adjusting turn off the Analyzer, remove the DC plug and wait one minute until the high voltage is discharged itself.

Fit now carefully the tube board and fix it with two M3 x 4 screws.
Pick up the heatsink and fit it with two isolation washers and two M3 x 10 flat hat screws on the main board. Keep special care for correct adjustment according to the printed silk screen!
Finally fix the L7808CV with the same isolation washer and M3 x 10 screw.
Re-heat again all three solder pads of the voltage regulator with a soldering tip.



Now you can start the first test run with fitted EM800 tubes and the built-in microphone. But be aware as the high voltage is not touch-protected yet.
Tip: Due to the long storage time and the oxidation of the silver contacts, some tubes do not seem to work correct. Here a little "stirring" within the socket or the multiple removal and re-inserting of the tubes may help.

BIAS adjustment

The Magilyzer uses a trick with a variable positive grid bias to almost completely "disappear" the display when no signal is applied. With the trimmer potentiometer BIAS this adjustment can be performed as follows:
Set all slide potentiometers to minimum and keep the Magilyzer turned on for 15 minutes without signal. Then adjust the trimmer BIAS so that only a very thin dash line is visible on the display of the tubes. However, certain tolerances must be accepted at this stage - but this becomes normalized over the operating time of the following many hours, and the thin dash line will disappear.

Other settings

With the trimmer potentiometer TR1 ... TR6, the averaging and sensitivity of the tubes can be adjusted to your own taste. We recommend the default middle setting.

Trimmer potentiometer TR9 can be used to adjust the sensitivity of the line input (RCA and TRS). Normally the middle setting is a good starting point and does not need to be changed.

By fitting LED1 ... 6 and R58 ... R63 as series resistors, a socket illumination of the EM800 tubes can be realized:
Six 3 mm LEDs needs to be soldered with a spacing of 7 mm to the mainboard. A recommended value for the resistors is 3.3 ... 4.7kOhm.
But this is not part of the DIY kit and is available on request by the vendor in various LED colours.

Enclosure assembly

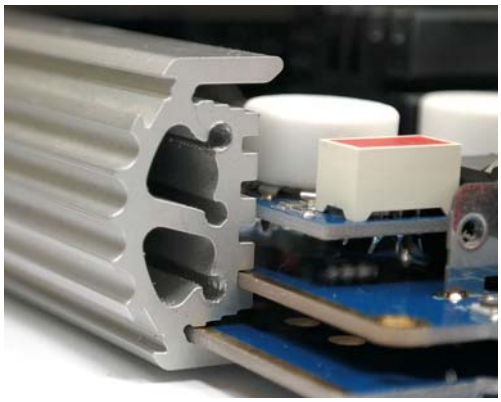
Please remove all tubes and put them aside in a safe place.

Pick up now a black 3 mm intermediate frame and the engraved rear panel and remove the total of three protective films.
Fit the rear panel carefully and precisely on the intermediate frame.

Proceed in the same way with the second intermediate frame and the front panel.

Pick up the two side profiles and attach them to the **rear frame** with four GF 3 x 8 self tapping screws.

Pick up the perforated bottom plate and fix it in the **correct direction** (labeled "FRONT") on the two M3 x 12 distances with the remaining two M3 x 4 screws.



Now insert this "sandwich" into the profiles.

Pick up the top cover, peel off the protective film(s) and slide it into the most top groove of the profiles above the tube sockets into the housing.

Place the Magilyzer in a normal position on the desktop.

Pick up the front panel and tilt it slightly upwards like to screw it on the profiles.

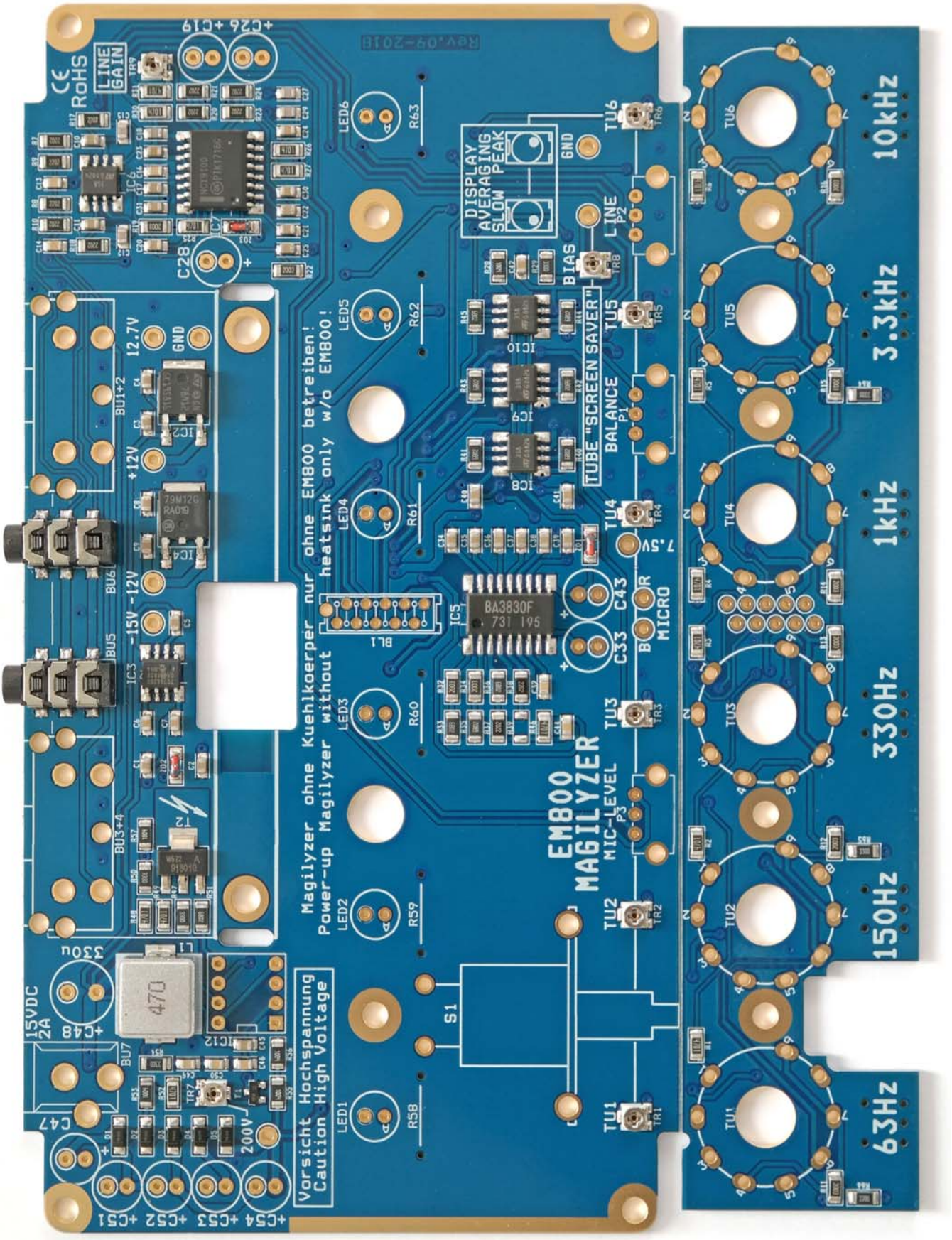
Now insert the microphone through the hole in the engraved front so that the front of the microphone is flush with the front panel.

Screw the front panel frame with the remaining four GF 3 x 8 screws.

Finally, stick the four self-adhesive feet on the bottom plate in the four corners.

After re-inserting the EM800 your Magilyzer is ready for use

Congratulations and have a lot of fun with your DIY device.


EM800
MAGILYZER
Magilyzer ohne Kuehlkoerper nur ohne EM800 betreiben!
Power-up Magilyzer without heatsink only w/o EM800!
Vorsicht Hochspannung
Caution High Voltage
15VDC
2A
LINE GAIN
MIC-LEVEL
BALANCE
TUBE "SCREEN SAVER"
BIAS
DISPLAY
AVERAGING
SLOW PEAK
63Hz
150Hz
330Hz
1kHz
3.3kHz
10kHz

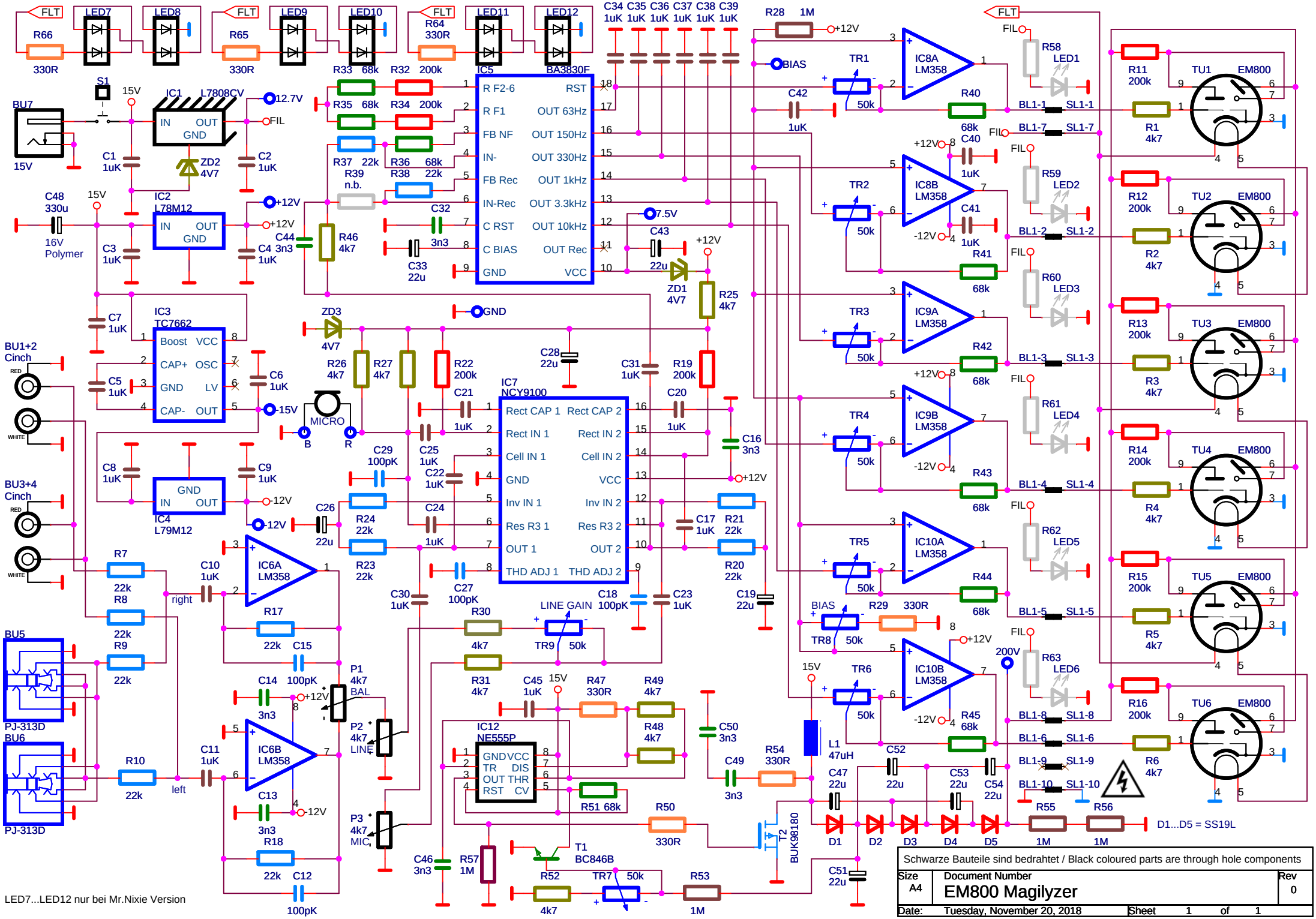
Stückliste EM800 Magilyzer

Check	Stück	Bezeichnung	Bauform	Ref.
SMD -Bauteile, bereits bestückt und gelötet				
	2	PJ-313D 3.5mm Klinkenbuchse		BU5,BU6
	30	1uF 16V min. Keramik-Kondensator	0805	C1,C2,C3,C4,C5,C6,C7,C8,C9,C10, C11,C17,C20,C21,C22,C23,C24,C25,C30,C31, C34,C35,C36,C37,C38,C39,C40,C41,C42,C45
	5	100pF 16V min. Keramik-Kondensator	0805	C12,C15,C18,C27,C29
	8	3n3 50V min. Keramik-Kondensator	0805	C13,C14,C16,C32,C44,C46,C49,C50
	5	SS19L Schottky Diode 90V	Sub SMA	D1,D2,D3,D4,D5
	1	L78M12CDT-TR 12V pos. Spannungsregler	DPAK	IC2
	1	MC79M12CDTG 12V neg. Spannungsregler	DPAK	IC4
	1	TC7662BCOA713 Microchip Ladungspumpe	SO-8	IC3
	1	BA3830F Audio Analyzer Chip	SO-18	IC5
	4	LM358DT 2-fach Operationsverstärker	SO-8	IC6,IC8,IC9,IC10
	1	NCY9100 2:1 Audio-Kompressor	SO-16	IC7
	1	47uH 3A Spule geschirmt	11.2 x 10 mm	L1
	9	50k Trimmer SMD	3 x 3 mm	TR1,TR2,TR3,TR4,TR5,TR6,TR7,TR8,TR9
	15	4k7 1%	1206	R1,R2,R3,R4,R5,R6,R25,R26,R27,R30, R31,R46,R48,R49,R52
	5	1M 1%	1206	R28,R53,R55,R56,R57
	12	22k 1%	1206	R7,R8,R9,R10,R17,R18,R20,R21,R23,R24, R37,R38
	10	200k 1%	1206	R11,R12,R13,R14,R15,R16,R19,R22,R32,R34
	10	68k 1%	1206	R33,R35,R36,R40,R41,R42,R43,R44,R45,R51
	7	330R 1%	1206	R29,R47,R50,R54,R64,R65,R66
	1	BC846B	SOT-23	T1
	1	BUK98180 N-Ch. MosFet 100V	SOT-223	T2
	3	4V7 Zenerdiode	MiniMelf	ZD1,ZD2,ZD3
		nicht bestückt		R39
	133	Gesamtanzahl an bestückten SMD-Bauteilen		

Check	Stück	Bezeichnung	Bauform	Ref.
Bedrahtete Bauteile				
	2	Stereo-Cinch-Buchsen		BU1+2,BU3+4
	1	DC-Hohlklinkenbuchse	HEBW21	BU7
	1	Schalter	SDKL	S1
	1	Druckknopf	8.7 x 10.2 mm	S1
	3	ALPS Mini-Schieberegler 4.7k		P1,P2,P3
	1	Micromatch Buchsenleiste	10-pol.	BL1
	1	Micromatch Stiftleiste	10-pol.	SL1
	10	22uF 100V low ESR Elko	6.3 x 11 mm	C19,C26,C28,C33,C43,C47,C51,C52,C53,C54
	1	330uF 16V Polymer Elko	8 x 11.5 mm	C48
	1	Elektret-Mikro	3,5 mm	B / R
	6	Flächen-LEDs **nur bei Mr.Nixie Version**		LED7…12
	1	L7808CV Spannungsregler	TO-220	IC1
	1	NE555 Timer-IC	DIP-8	IC12
	1	IC-Sockel 8-polig	DIP-8	IC12
	3	M3 x 10 Tx Flachkopfschrauben		Befestigung Kühlkörper und L7808CV
	3	Isoliernippel		Befestigung Kühlkörper und L7808CV
	2	M3 x 6 Distanzen	Di M3x6	Abstandshalter Main / Tube-Board
	2	M3 x 12 Distanzen	Di M3x12	Abstandshalter Tubeboard / Boden
	8	M3 x 4 Tx Schrauben		Befestigung an den Distanzen
	8	GF 3 x 8 Tx Schrauben gewindeformend		Befestigung Vorder und Rückseite
	4	Selbstklebefüße	95 x 4.8 mm	

Check	Stück	Bezeichnung	Bauform	Ref.
Divers				
	1	Kühlkörper SK125-84SA		
	2	GB76-81-ME Profiil		
	1	Acrylglassatz		2 x Zwischenrahmen 3 mm schwarz 1 x Frontplatte 1.6 mm graviert 1 x Rückseite 1.6 mm graviert 1 x Oberseite 3 mm transparent (Jan Wüsten Version) oder verspiegelt und graviert (Mr.Nixie Version)
	1	Netzteil 15V 2A	5.5/2.1 mm	

Check				
Spezial				
	6	Röhrensockel		TU1,TU2,TU3,TU4,TU5,TU6
	6	EM800 Magische Bänder		TU1,TU2,TU3,TU4,TU5,TU6


FLT
LED7
LED8
LED9
LED10
LED11
LED12
R66
330R
R65
R64
IC5
BA3830F
C34 C35 C36 C37 C38 C39
1uK
R28 1M
+12V
BIAS
TR1
IC8A
LM358
R40
68k
C42
1uK
C40
C41
R41
TR2
IC8B
TR3
IC9A
R42
TR4
IC9B
R43
TR5
IC10A
R44
TR6
IC10B
R45
TR8
R29 330R
R58
R59
R60
R61
R62
R63
LED1
LED2
LED3
LED4
LED5
LED6
BL1-1
BL1-2
BL1-3
BL1-4
BL1-5
BL1-6
BL1-7
BL1-8
BL1-9
BL1-10
SL1-1
SL1-2
SL1-3
SL1-4
SL1-5
SL1-6
SL1-7
SL1-8
SL1-9
SL1-10
R11 200k
R12 200k
R13 200k
R14 200k
R15 200k
R16 200k
R1 4k7
R2 4k7
R3 4k7
R4 4k7
R5 4k7
R6 4k7
TU1 EM800
TU2 EM800
TU3 EM800
TU4 EM800
TU5 EM800
TU6 EM800
S1
BU7
15V
IC1 L7808CV
IN OUT GND
12.7V
FIL
ZD2 4V7
C1 1uK
C2 1uK
C48 330u
16V Polymer
IC2 L78M12
C3 1uK
C4 3nK
+12V
R33 68k
R32 200k
R35 68k
R34 200k
R37 22k
R39 n.b.
R36 68k
R38 22k
C32 3nK
C33 22u
C44 3nK
R46 4k7
7.5V
C43 22u
ZD1 4V7
R25 4k7
GND
IC3 TC7662
Boost VCC
CAP+ OSC
GND LV
CAP- OUT
C5 1uK
C6 1uK
C7 1uK
ZD3 4V7
R26 4k7
R27 4k7
R22 200k
C28 22u
C31 1uK
R19 200k
C20 1uK
C16 3nK
C21 1uK
C25 1uK
C22 1uK
C29 100pK
C26 22u
R24 22k
C24 1uK
R23 22k
C27 100pK
C30 1uK
C18 100pK
C23 1uK
C17 1uK
R21 22k
R20 22k
C19 22u
IC7 NCY9100
Rect CAP 1
Rect CAP 2
Rect IN 1
Rect IN 2
Cell IN 1
Cell IN 2
GND
VCC
Inv IN 1
Inv IN 2
Res R3 1
Res R3 2
OUT 1
OUT 2
THD ADJ 1
THD ADJ 2
MICRO
B
R
BU1+2 Cinch
BU3+4 Cinch
RED
WHITE
C8 1uK
C9 1uK
IC4 L79M12
GND IN OUT
-12V
R7 22k
R8 22k
R9 22k
C10 1uK
IC6A LM358
right
R17 22k
C15 100pK
C14 100pK
3nK
P1 4k7 BAL
P2 4k7 LINE
P3 4k7 MIC
BU5
BU6
PJ-313D
R10 22k
left
C11 1uK
IC6B LM358
C13 3nK
R18 22k
C12 100pK
LINE GAIN
R30 4k7
TR9 50k
R31 4k7
C45 1uK
R47 330R
R49 4k7
R48 4k7
IC12 NE555P
GND VCC
TR DIS
OUT THR
RST CV
R51 68k
R50 330R
C46 3nK
R57 1M
T1 BC846B
R52 4k7
TR7 50k
R53 1M
C50 3nK
C49 3nK
R54 330R
L1 47uH
C47 22u
C52 22u
C53 22u
C54 22u
T2 BUK98180
C51 22u
D1 D2 D3 D4 D5
R55 1M
R56 1M
200V
D1...D5 = SS19L
LED7...LED12 nur bei Mr.Nixie Version
Schwarze Bauteile sind bedrahtet / Black coloured parts are through hole components
Size A4
Document Number
EM800 Magilyzer
Rev 0
Date: Tuesday, November 20, 2018
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