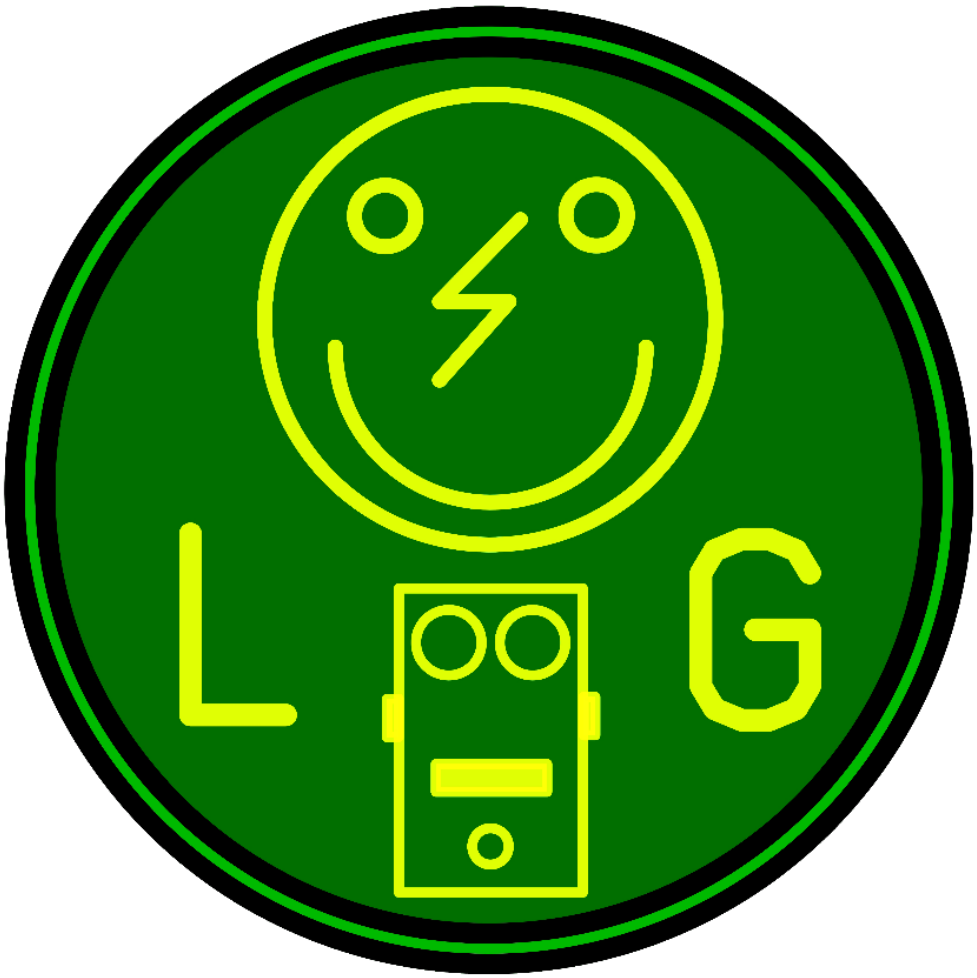
Sultan of Tone

Building instructions

V3.0.3



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Read this entire manual thoroughly before you start to building the effect! Especially the Modification part. Decide before building the effect which mods you want to try so that you do not need to desolder parts later.

Last update: 09-04-2017

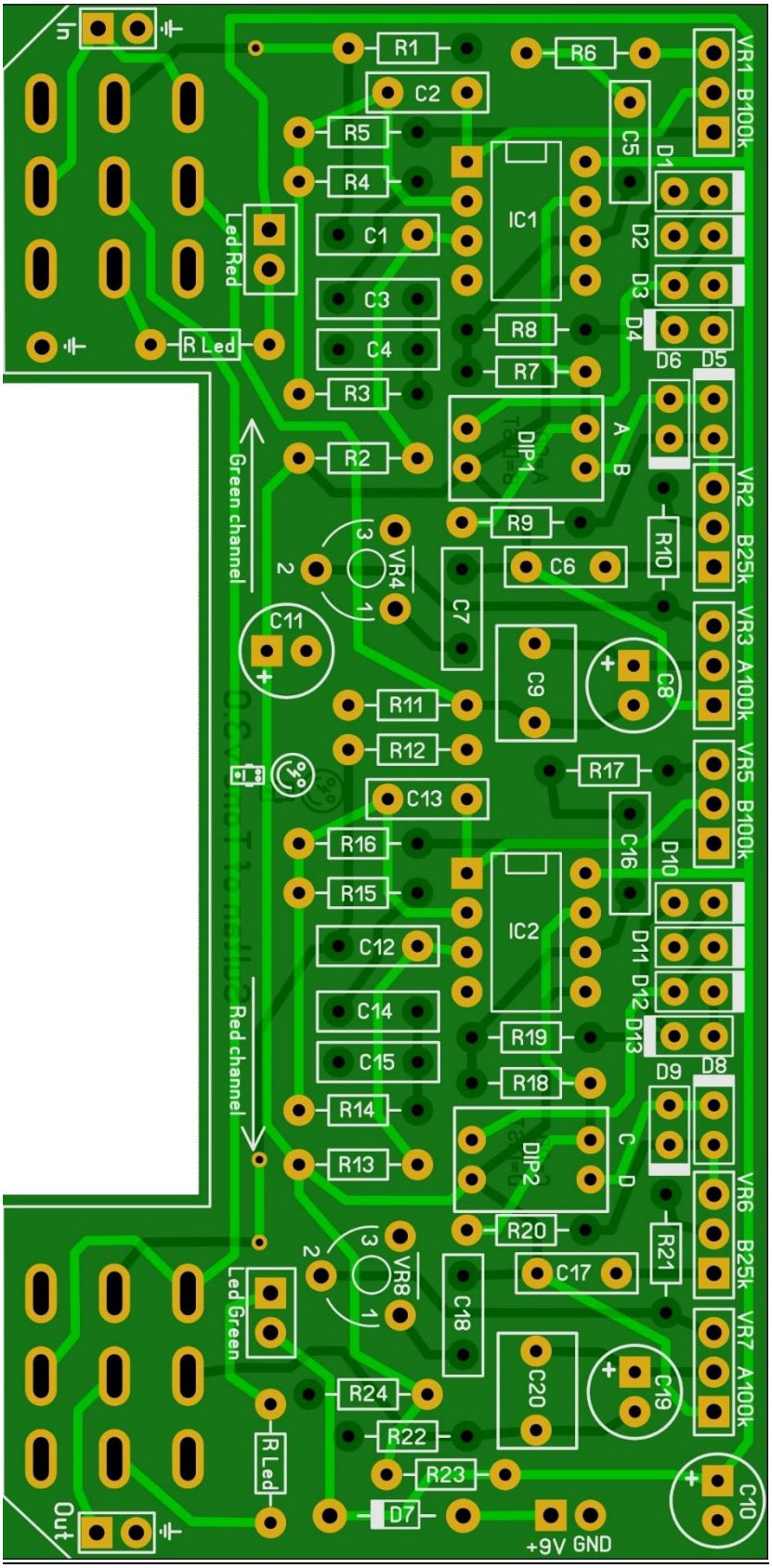
Components

Name	Value	Comment	Name	Value	Comment
C1	10n	SMF	**R1**	1M	
C2	100p	Ceramic/SML	**R2**	1M	
C3	10n	SMF	**R3**	27k	
C4	10n	SMF	**R4**	33k	
C5	100n	SMF	**R5**	10k	
C6	10n	SMF	**R6**	10k	
C7	10n	SMF	**R7**	220k	
C8	1u	Electrolyte 35V	**R8**	6k8	
C9	1u	SMF	**R9**	1k	
C10	100u	Electrolyte	**R10**	6k8	
C11	100u	Electrolyte	**R11**	1M	
C12	10n	SMF	**R12**	1M	
C13	100p	Ceramic/SML	**R13**	1M	
C14	10n	SMF	**R14**	27k	
C15	10n	SMF	**R15**	33k	
C16	100n	SMF	**R16**	10k	
C17	10n	SMF	**R17**	10k	
C18	10n	SMF	**R18**	220k	
C19	1u	Electrolyte 35V	**R19**	6k8	
C20	1u	SMF	**R20**	1k	
IC1	JRC4580D		**R21**	6k8	
IC2	JRC4580D		**R22**	1M	
L Green	Orange!!	3mm	**R23**	47k	
L Red	Red	3mm	**R24**	47k	
D1	MA856		**R led**	3k3	For Red LED
D2	MA856		**R led**	3k3	For Orange LED
D3	MA856		**VR1**	B100k	Gain Red Channel
D4	MA856		**VR2**	B25k	Tone Red Channel
D5	1S1588		**VR3**	A100k	Volume Red Channel
D6	1S1588		**VR4**	B50k	Treble boost Red Channel
D7	1N5817		**VR5**	B100k	Gain Orange Channel
D8	1S1588		**VR6**	B25k	Tone Orange Channel
D9	1S1588		**VR7**	A100k	Volume boost Orange Channel
D10	MA856		**VR8**	B50k	Treble boost Orange Channel
D11	MA856		**DIP1**		2 position dip switch
D12	MA856		**DIP2**		2 position dip switch
D13	MA856				

Bill of Materials

Capacitors			
Value	**Amount**	**Type**	**Rating**
10n	10	SMF	35V or higher
100n	2	SMF	35V or higher
1u	2	SMF	35V or higher
100p	2	Ceramic Multi Layer	35V or higher
1u	2	Electrolyte	35V or higher
100u	2	Electrolyte	35V or higher
Diodes			
Value	**Amount**	**Type**	
1N5817	1		
1S1588	4		
MA856	8		
LED	1	Red 3mm	
LED	1	Orange 3mm	
IC			
Value	**Amount**	**Type**	
JRC4580D	2		
Resistors			
Value	**Amount**	**Type**	
1k	2	metalfilm 1%	
3k3	2	metalfilm 1%	
6k8	4	metalfilm 1%	
10k	4	metalfilm 1%	
27k	2	metalfilm 1%	
33k	2	metalfilm 1%	
47k	2	metalfilm 1%	
220k	2	metalfilm 1%	
1M	6	metalfilm 1%	
A100K	2	16 mm alpha pot	
B100k	2	16 mm alpha pot	
B25K	2	16 mm alpha pot	
B50k	2	6 mm trimpot	
Switches			
Value	**Amount**	**Type**	
DIP2	2	2 position DIP switch	

PCB layout



NB. There are some mistakes made in the channel and LED descriptions on the PCB. Green channel on the PCB should be *Red channel*, Red Channel on the PCB should be *Orange channel*. Led Green should be *Led Orange*. This does not affect the functioning of the board in any way, just read the instructions carefully!!

General guideline for components

- Capacitors: All values under 1nF should be ceramic disks or silver mica. From 1nF up to 1uF should be SMF (Panasonic stacked metal film) or MKT (Metallized plastic polyester) and values over 1uF use electrolyte caps 16V+ rated and watch out for polarity***! I rated them at 35V+ in case you plan on using a charge pump. All components should then be rated 35V or more.***
- Resistors: use 1% metal film for the best results.
- Socket the IC's. This way you can easily mod them or replace them if they break.

Building sequence

Soldering this board can be very complicated for some people since the solder pads are very close together. Use a magnifying glass to make the job easier. If you want to experiment with other diodes than you could socket them instead of soldering them to the board. You'll need a 20 SIL, break off the sockets and solder them to the board.

Start by soldering the resistors (but not yet VR7 and VR8) and then the diodes. All diodes need to be soldered in an upright position except for D7. Again, If you want to socket the diodes then skip them till you start soldering the sockets.

Note: Diodes are fragile!! Do not expose them to heat for too long or they'll break. Do not blow on your solder in an attempt to cool it down. That will possibly result in a bad join that might corrode!

Solder the small ceramic capacitator C2 and C13 next.

Solder the 10n and 100n SMF/MKT capacitors. Next, solder the IC sockets (and diode sockest), then the DIP switches (only if you do not intend to use the external diode mod on page 9 else leave out the dipswitches!) and lastly solder the 1u SMF and electrolyte capacitors.

NB. It is best that you solder the electrolytes on the bottom side of the pcb instead of the top side. This will save you a lot of space.

Finally solder the presence/treble boost trim pot VR4 and VR8. If you want to control the presence externally than do not solder VR4 and VR8 but use a B50k pots. For your convenience I marked the pinning on the PCB. The pots default setting is all the way to the right. To boost treble, turn the pots to the left.

Place the IC (and diodes) and you are almost ready to rock.

Besides the components mentioned in the table on the page 3, you will need:

- **2 input jacks**. 2 mono jacks if you are not going to use a battery but only the 9V adapter. 1 mono (for output) and 1 stereo jack (for input) if you will be using both a 9V battery and the 9V adapter.
- **2 x 3PDT footswitch** (9 pins).
- **2,1mm DC jack** (isolated).
- **9v battery clip** (optional).
- **22 gage stranded hook-up wire.**
- **2 x LED** (Red and Green or Red and Orange).
- **Hammond 1590BB** case (or similar) in your favorite color. A **Hammond 1590DD** or **Hammond 1590XX** will give you more room to build especially when using an external presence pot.

Modifications

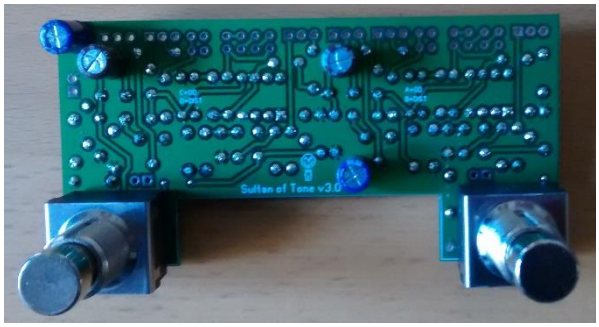
- You can experiment with different diodes for D1-D6 and D8-D13. MA856 and 1S1588 are very hard to find and there are a lot of fakes sold from China. An alternative for MA856 is BA282. For 1S1588 there are 1n4148, 1n914, but also think outside the box with 1N4001, BAT41, BAT46, LED's etc. If you want to experiment then socket the diodes!
  Watch out with using Germanium diodes. The volume drop might be too big.
- You can also choose to do 1 side MA856 and the other 1S1588. For instance make D1-D6 all 1S1588 and D8-D13 all MA856.
- For the High Gain mod just switch out the B100k VR1 (and/or VR5) for a B250k.
- You can also try different OpAmps like TL072, OPA2134, AD712, NE5532, JRC4558 etc.

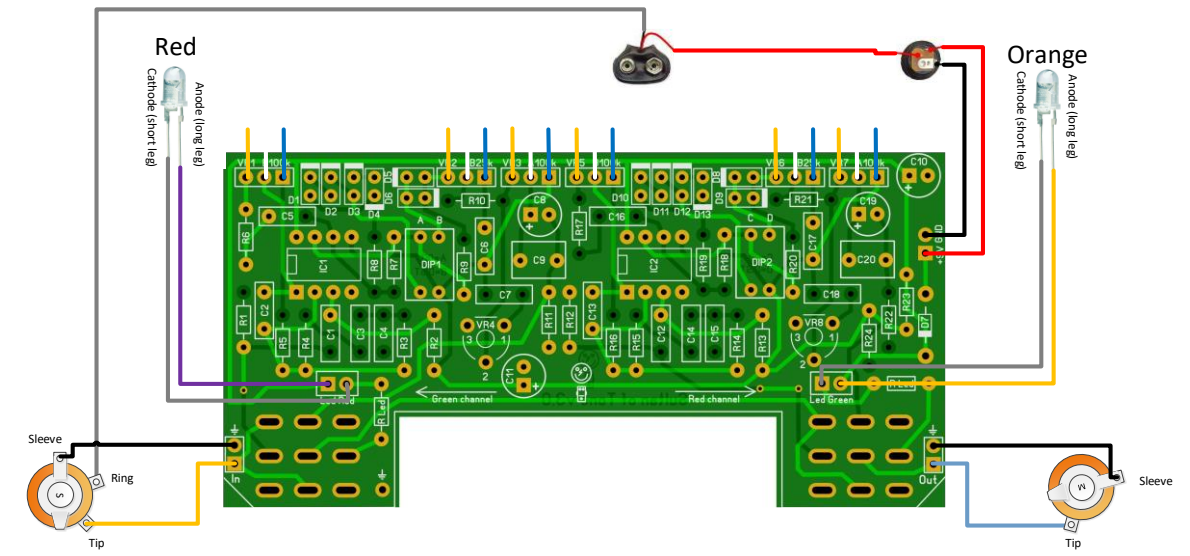
Off board wiring and drilling

This version of the Sultan of Tone has integrated 3PDT print. This will save you time for off board wiring, but It will require you to drill more precise!

Before you start you must drill the 2 footswitch holes in your enclosure. Heart to heart distance of the footswitch holes is **76,65 mm**. When using a Hammond 1590BB I suggest you drill a **13mm** hole at **75,5mm from the top** and **17,7 mm from the left** of the enclosure. The other **13mm** hole should be at **75,5mm from the top** and **94,3 mm** from the left of the enclosure.

Now put the 3PDT footswitches in the enclosure and tighten them secure. Place the PCB on the footswitches and solder them. Remove the footswitches (and thus the PCB) and drill the holes for the pots and switches. The rest of the pots and LEDs can be put anywhere you want, just remember that you probably soldered the electrolyte caps on the bottom side so measure before drilling!

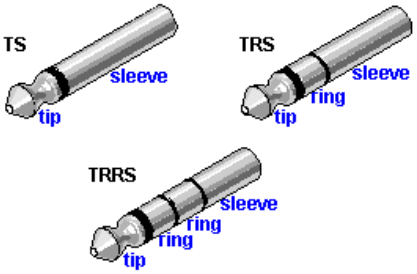




Input Jack

Output Jack

Blue = pin 1
White = pin 2
Yellow = pin 3



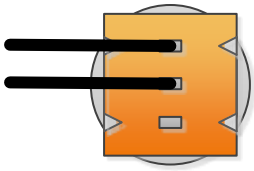
The wiring diagram is a copy of the latest original version. You should use a **RED LED** in the slots of **Led Red** in the (R Led=3k3 for 9V/18V) and an **ORANGE LED** in the **Led Green** (R Led=3k3 for 9V/18V).

NOTE 1: The pads on the Led Green are reversed. Connect them <u>exactly</u> as mention in the above picture!

Diode switch settings

Instead of using the dipswitches, you can make either 4 external SPDT switches for or 2 DP3T switches. If you choose 4 separate switches, it will look something like this:

A/B/C/D



Switches A, B, C, D can all be connected the same way as shown in the picture above. All ways of connecting both wires to the switch are valid as long as you do not connect it to both outer lugs.

The switch settings are independent of using DIP or separate switches and are as follows:

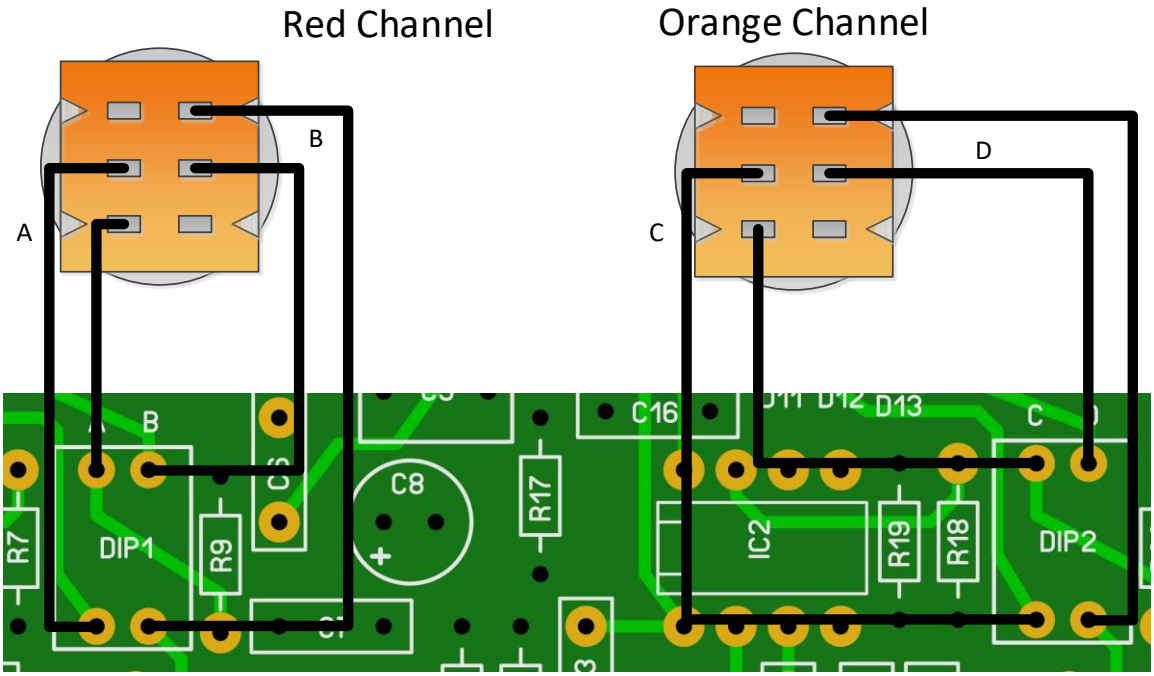
Channel	**Red**		**Orange**	
Dip Switch	**A**	**B**	**C**	**D**
Clean	OFF	OFF	OFF	OFF
OD	ON	OFF	ON	OFF
Distortion	X	ON	X	ON

X = setting is irrelevant, either ON or OFF

So If you want an OD Red channel and a distortion Orange channel then it is:

A:ON **B**: OFF **C**: X **D**:ON

You can also use a DP3T switch per channel to select OD (Up)/Clean (Middle)/Distortion (Down). You will need an ON/OFF/ON switch for that and wire it like this:



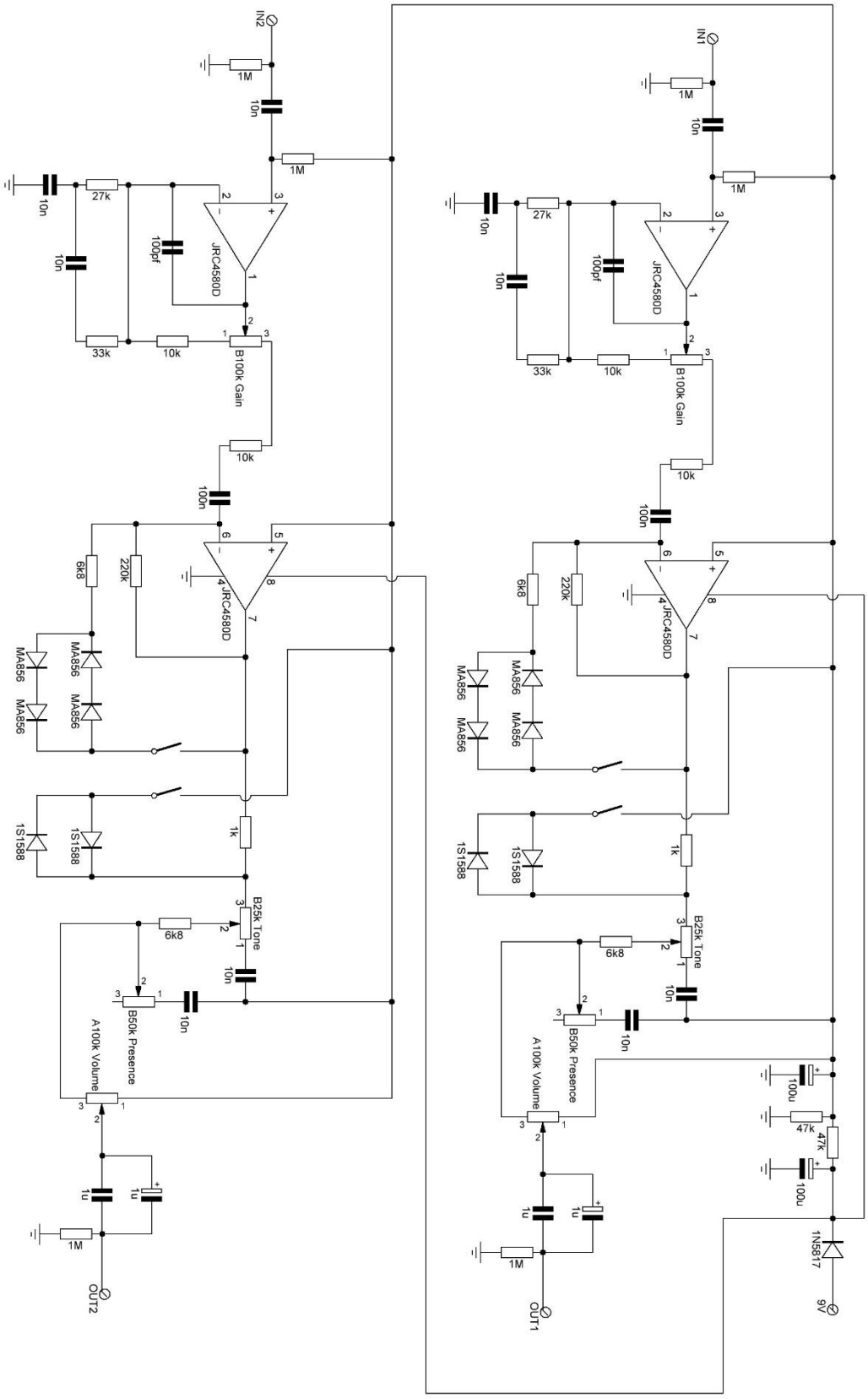
Troubleshooting

All PCB's have been 100% factory e-tested and out of every batch I receive I build a effect to double check, so there should not be a connection problem on the PCB itself.

The board is not working (at all), what now?

- Check if your 9V is plugged in correctly (and/or soldered correctly on the board).
- Check that you oriented the capacitors, IC's ,transistors and diodes the right way. SMF, MKT capacitors and resistors do not need to be oriented.
- Check if you used the correct values of the components. For resistors you can look here: http://www.diyaudioandvideo.com/Electronics/Color/
- Double and triple check your soldering! A loose or cold solder can be really bad for your board.
- Replace the IC's and transistors, one might be defective. Before doing that first unplug the 9V and wait 5 seconds.
- Check that you have good/high grade components. A lot of Chinese sourced parts are fakes (especially high end opamps, vintage diodes and transistors) so be careful that you source your parts from reliable suppliers.

Schematic


IN2
IN1
1M
10n
27k
100pf
JRC4580D
33k
10k
B100k Gain
100n
6k8
220k
MA856
1S1588
1k
B25k Tone
B50k Presence
A100k Volume
1u
OUT2
OUT1
100u
47k
1N5817
9V