

ClapSnap handclap synthesizer DIY project



v1.02



Poland, Poznań, 16.12.2017

1. Introduction

There are some other analog handclap circuits fe. Roland TR808 HC or Boss HC-2. Both uses filtered noise for "clap" and "fake echo" part. This circuit uses filtered noise for "fake echo" and triangle wave output VCO for "clap" part. But you don't hear triangle waveform. It is frequency-modulated (from envelope and sine generator) so fast, it resembles series of positive and negative, almost random pulses - thats why every clap sounds a little different. VCO envelope consists of not equally spaced pulses, and their number is three or four (in other circuits there are three evenly spaced pulses). This envelope is also modulated from sine generator. A lot of modulation is happening here. If you are a big handclap fan you can't miss this one!

For sound demo check my homepage: **syntherjack.net**

What's interesting in this project:

- distinct sounding handclap,
- ensemble (clap) sound is shaped from triangle waveform, not from noise, like in 808 or HC-2 projects,
- unique humanizer circuit causes each clap to sound different,
- extended triggering possibilities,
- build-in autotrigger.

2. General information

Controls:

- noise (crash) pitch (filter cutoff frequency),
- noise (crash) decay,
- clap (ensemble) pitch (triangle waveform generator pitch),
- clap (ensemble) decay,
- clap (ensemble) modification,
- autotrigger speed,
- audio trigger sensivity,
- noise / clap balance,
- humanizer on / off,
- autotrigger on / off,
- output level,
- manual trigger panel switch (not used by default).

I/O:

- synth trigger input – standard drum triggering pulse,
- manual trigger foot switch input (not used by default),
- audio signal trigger – triggers clap if audio signal occurs, works great with other drum modules audio output,
- handclap output,
- trigger LED,
- humanizer on / off LED,
- autotrigger on / off LED,
- autotrigger speed LED (not used by default),

Power consumption – maximum

- 50 mA @ +12V, 10 mA @ -12V,
- works well with + / - 15 V, but wasn't hardcore tested.

3. PCB information

PCB is double-sided, 80 x 100 mm.

PCB is designed for some more modifications and functions, **not included** on front panel and BOM:

- filtered noise output / external noise input (filter break),
- humanizer generator break,
- manual trigger switch,
- external footswitch input,
- autotrigger speed LED.

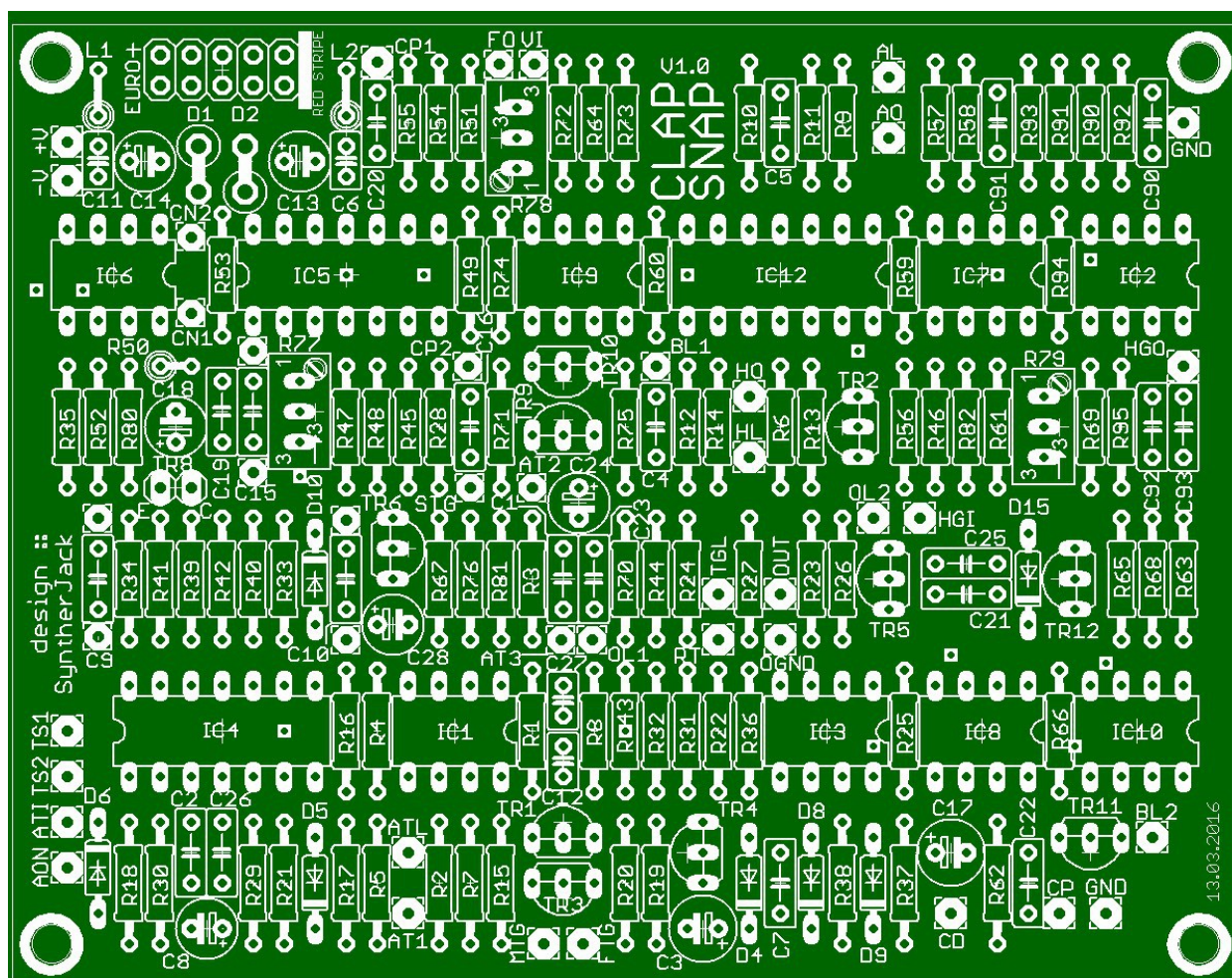


Illustration 2: ClapSnap v1.0 PCB TOP side view, vector graphics

The following table contains all wire soldering points available on PCB with short description. MDx are modification points.

Table 1. Wire pads on PCB

Point on PCB	Description	Notes
MD1	Clap (ensemble) pulse length mod	Near C15 capactor, not marked on PCB
MD2	Clap (ensemble) pulse length mod	
MD3	Clap (ensemble) pulse length mod	Near C10 capactor, not marked on PCB
MD4	Clap (ensemble) pulse length mod	
MD5	Clap (ensemble) pulse length mod	Near C9 capactor, not marked on PCB
MD6	Clap (ensemble) pulse length mod	
HGI	Humanizer generator output	Connected by default
HGO	Humanizer signal input	
CP	Clap (ensemble) pitch POTENTIOMETER	-
RT	Clap (ensemble) decay POTENTIOMETER	-
CP1	Noise (crash) pitch POTENTIOMETER	-
CP2	Noise (crash) pitch POTENTIOMETER	-
FO	Filter output	Connected by default
FI	Filtered noise input	
CD	Noise (crash) decay POTENTIOMETER	-
CN1	Noise generator twisted wire	Wires are twisted, but not connected
CN2	Noise generator twisted wire	
BL1	Noise / clap balance POTENTIOMETER	-
BL2	Noise / clap balance POTENTIOMETER	-
OL1	Output level control POTENTIOMETER	-
OL2	Output level control POTENTIOMETER	-
OUT	Handclap signal output	Use with OGND
AON	Audio on/off	
ATI	Audio trigger input	Grounded, if trigger nor connected, use switched socket
TS1	Audio trigger sensivity POTENTIOMETER	
TS2	Audio trigger sensivity POTENTIOMETER	
MTG	Manual trigger input SWITCH	Not used by default
FTG	Foot trigger input SWITCH	Not used by default
STG	Synth trigger input	Your main trigger
TGL	Trigger LED	For all triggers
AT1	Auto trigger speed POTENTIOMETER	-

AT2	Auto trigger speed POTENTIOMETER	-
AT3	Auto trigger speed POTENTIOMETER	-
ATL	Auto trigger speed LED	Blinks, not used by default
AO	Auto trigger generator on/off SWITCH	-
AL	Auto trigger on/off LED	-
HO	Humanizer on/off SWITCH	-
HL	Humanizer on/off LED	-
+V	Positive power supply	-
-V	Negative power supply	-
GND	Signal GROUND	-
OGND	Additional GROUND point for handclap output	Use with OUT

Some points are not marked on PCB. Look at the graphic below:

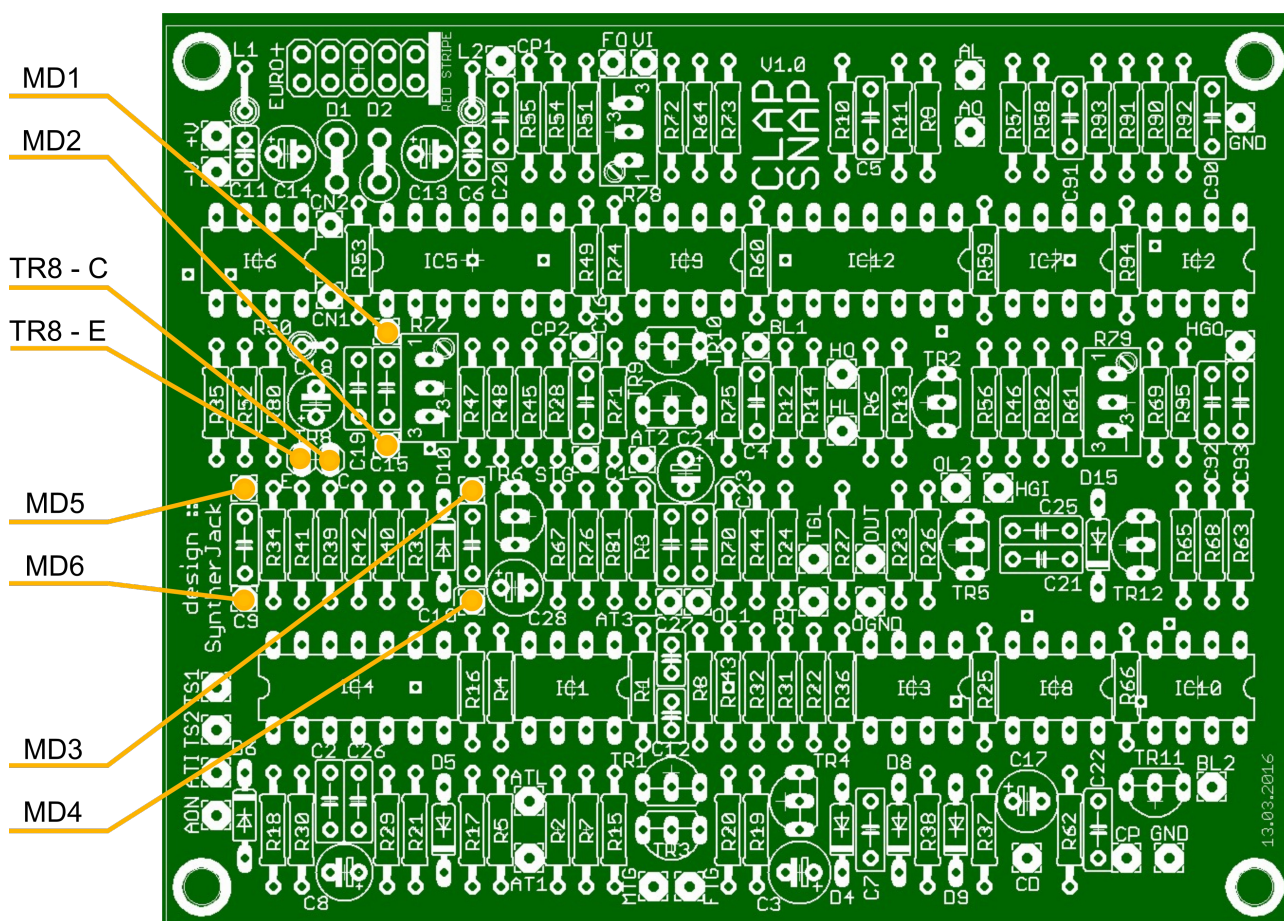


Illustration 3: Additional points not marked on PCB

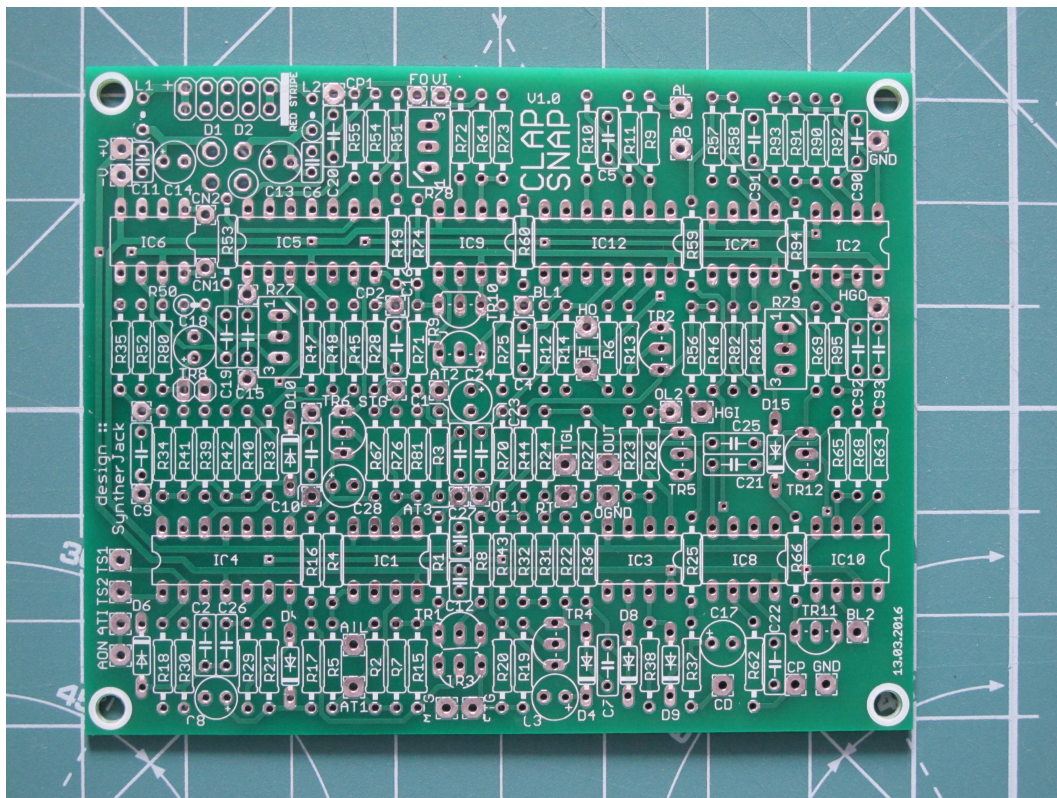


Illustration 4: TOP view of the PCB, photo

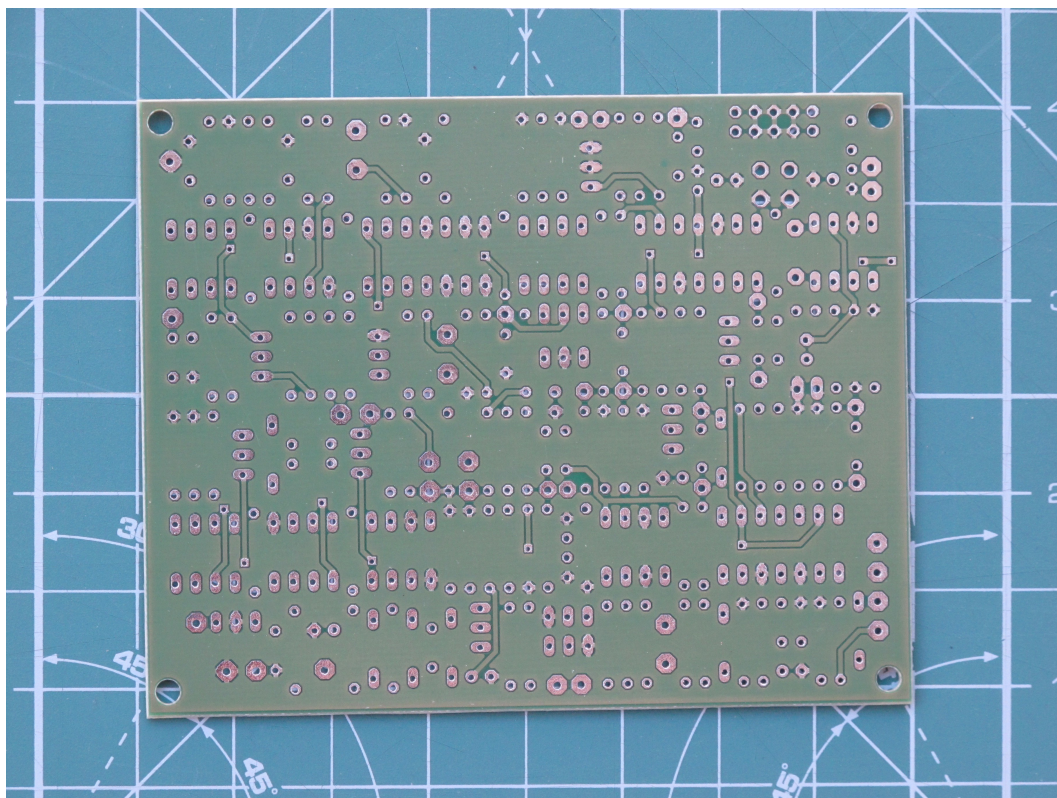


Illustration 5: BOTTOM view of the PCB, photo

Below picture of the soldered ClapSnap handclapper PCB is shown . What you should notice:

- **wire clamp** between FO and VI points (over blue box trimmer, right of the euro connector),
- **wire connection** between HGO and HGI (yellow wire),
- twisted pair of wires (black and yellow - CN1 and CN2) – they are **not connected** to each other, they act as capacitor,
- **not** all ICs in a row go in the same direction, be careful,
- D1 and D2 diodes are vertically mounted, circle = cathode (-),
- the only things to tweak on PCB are 3 trimmers (NOISE LEVEL, FILTER RESONANCE and VCA TRIM) – „set and leave” controls (check schematics or „First run” chapter for description). FILTER RESONANCE is not as exciting as you think, just leave it on PCB.

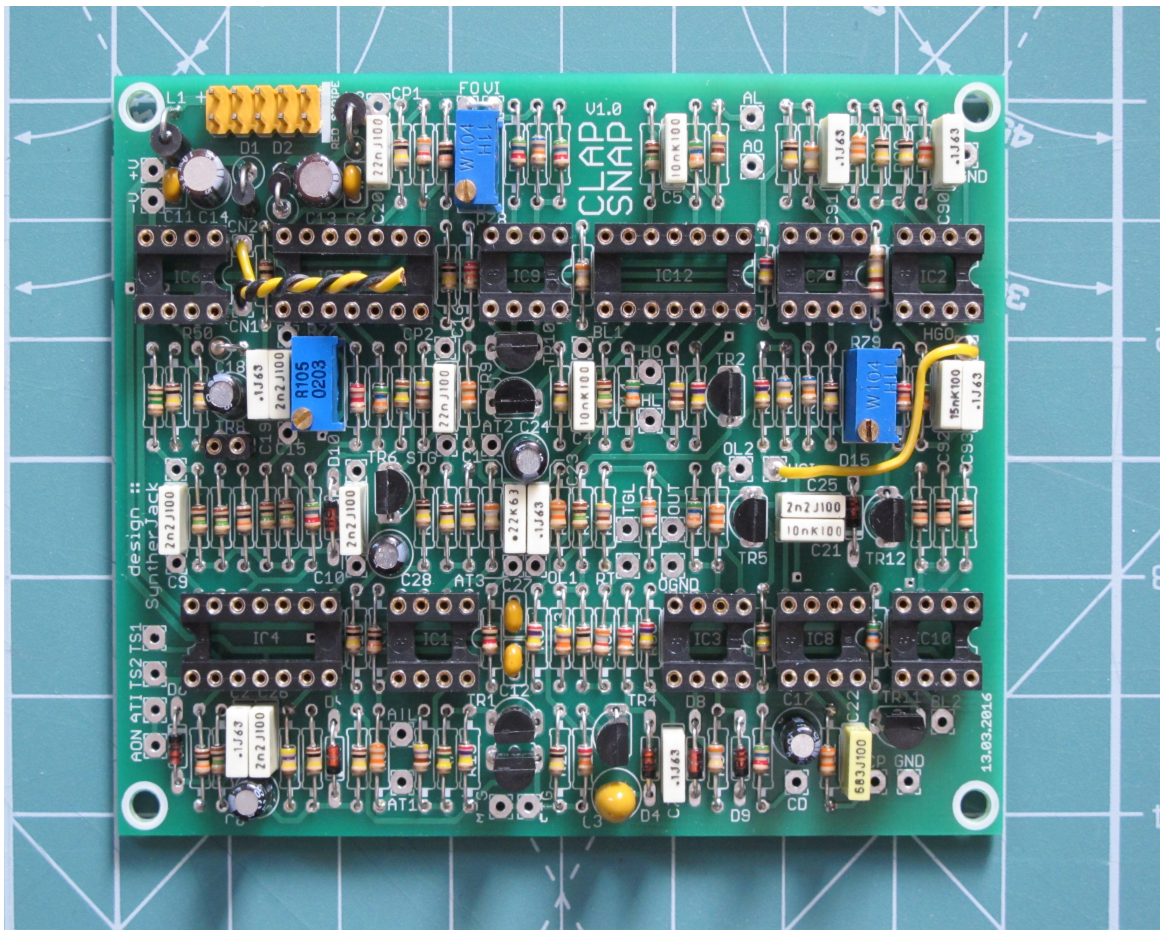


Illustration 6: Soldered ClapSnap PCB, final version 1.0

The following table shows parts numbers and corresponding values.

Remarks on BOM:

- all resistors are 1/4 Watt, 5%,
- D1 and D2 are for protection, 1N4004, 1N4007 or similar will work,
- somehow „rare” components are: CA3080 and NE566 (voltage controlled generator),
- **NE566** generates triangle waveform, **it is not the same as NE555!**
- If you feel output level is to low, try to replace R23 resistor (56k) with 100k,
- if noise level is to high, replace R50 (1M) with wire clamp,
- TR8 is a noise transistor of you choice, it uses small 1x2 socket ; look at the Illustration 3 and schematics for emitter (E) – collector (C) connection tips,
- 2 „pulse variation mod” capacitors can be chosen from 2n2 – 4n7 range for best results; bigger values causes the pulse pitch more noticable, which is not desired; I personally used two 4n7.

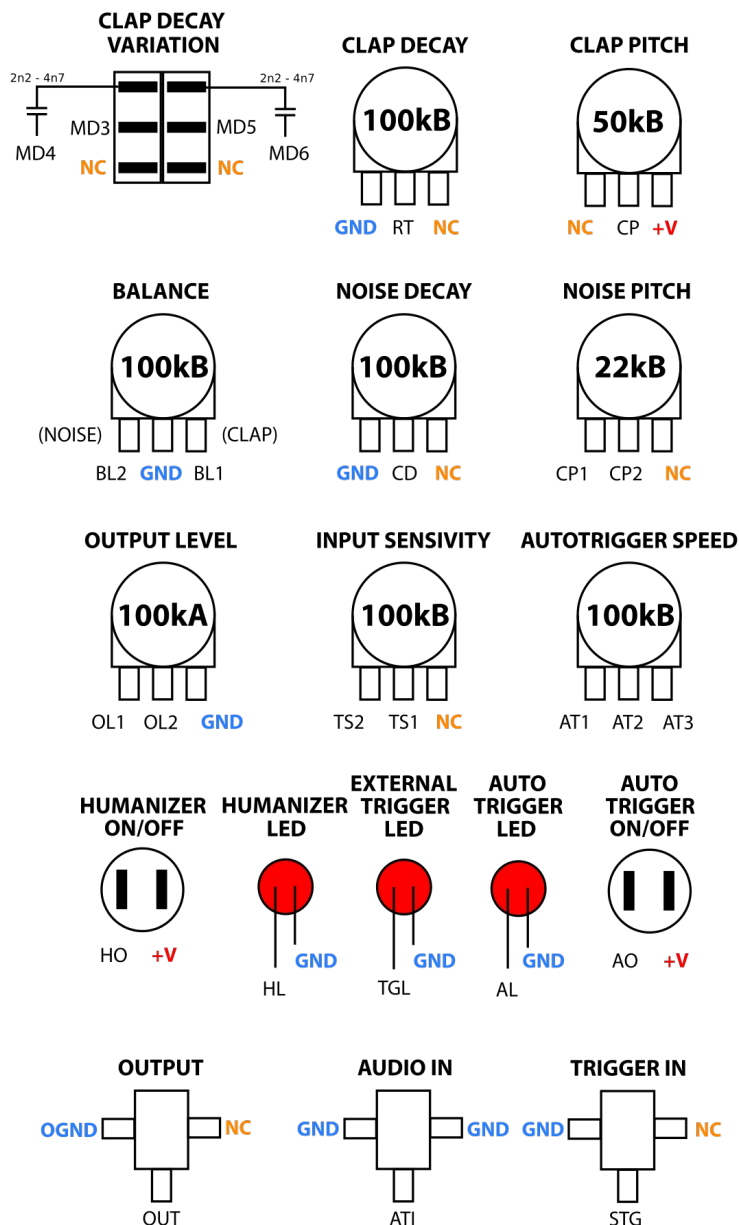
Table 2. Bill of materials

Qty	Value	Device	Parts
RESISTORS (5%)			
9	1M	1/4 W, 5 %	R10, R12, R30, R34, R40, R41, R42, R44, R50 (R50 mounted vertically)
1	1M5	1/4 W, 5 %	R35
1	1k	1/4 W, 5 %	R1
1	2k2	1/4 W, 5 %	R47
3	3k9	1/4 W, 5 %	R27, R31, R54
4	5k6	1/4 W, 5 %	R33, R37, R72, R73
7	10k	1/4 W, 5 %	R4, R18, R39, R51, R63, R65, R68
4	22k	1/4 W, 5 %	R19, R22, R69, R74
6	33k	1/4 W, 5 %	R5, R26, R62, R70, R71, R93
1	47k	1/4 W, 5 %	R43
6	56k	1/4 W, 5 %	R11, R14, R23, R48, R66, R95
2	68k	1/4 W, 5 %	R64, R82
1	82k	1/4 W, 5 %	R92
18	100k	1/4 W, 5 %	R16, R17, R20, R21, R32, R49, R52, R53, R55, R57, R61, R67, R75, R76, R80, R81, R90, R91
1	110k	1/4 W, 5 %	R94
3	150k	1/4 W, 5 %	R7, R25, R45
6	270k	1/4 W, 5 %	R8, R13, R15, R36, R56, R59
4	390k	1/4 W, 5 %	R3, R38, R58, R60
5	470R	1/4 W, 5 %	R2, R6, R9, R24, R28
1	470k	1/4 W, 5 %	R29
1	680k	1/4 W, 5 %	R46
POTENTIOMETERS			
2	100k	PCB trimmer, box type	R78, R79
1	1M	PCB trimmer, box type	R77
5	100kB	Panel mount, linear taper	CLAP DECAY, NOISE DECAY, BALANCE, SENSIVITY, AUTOTRIGGER SPEED
1	100kA	Panel mount, audio taper	OUTPUT LEVEL
1	50kB	Panel mount, linear taper	CLAP PITCH
1	22kB	Panel mount, linear taper	NOISE PITCH

CAPS			
4	1u	Electrolytic	C8, C18, C24, C28
1	4u7	Electrolytic	C17
2	10u	Electrolytic	C13, C14
1	4u7	Tantalum	C3
4	100n	Ceramic	C6, C11, C12, C27
2	22n	Film	C16, C20
1	68n	Film	C22
7	100n	Film	C2, C7, C19, C23, C90, C91, C93
1	220n	Film	C1
5	2n2	Film	C9, C10, C15, C25, C26
3	10n	Film	C4, C5, C21
1	15n	Film	C92
2	2n2 – 4n7	Film	Panel mount, pulse variation mod
SEMIS			
1	CD4013BE	Dual flip-flop, DIP14	IC12
8	BC546B	Generic transistor, TO92	TR1, TR2, TR3, TR4, TR5, TR6, TR10, TR12
2	BC556B	Generic transistor, TO92	TR9, TR11
1	LM301H	Opamp, DIP8	IC6
2	LM324N	Opamp, DIP14	IC4, IC5
4	LM1458N	Opamp, DIP8	IC1, IC2, IC3, IC7
2	LM3080N	Trans opamp, DIP8	IC9, IC10
1	NE566	Waveform generator, DIP8	IC8
2	1N4007	Generic silicon diode	D1, D2
7	1N4148	Generic silicon diode	D4, D5, D6, D8, D9, D10, D15
1	XXX	Noise transistor of choice	TR8, base cut
MISC			
1	PINHD-1X2	1x2 connector	Noise transistor connector (marked as TR8)
1	PINHD-2X5	2x5 connector	Eurorack power connector
2	0207/3V	Bead inductor	L1, L2
8	DIL8	Socket for lcs	
3	DIL14	Socket for lcs	
3	LED	Panel mount, LED of choice	SYNTH TRIGGER, AUTOTRIGGER ON, HUMANIZER ON
2	Jack socket	without switch	SYNTH TRIGGER INPUT, CLAP OUTPUT
1	Jack socket	with switch	AUDIO TRIGGER INPUT
1	Toggle switch	2P2T (DPDT)	Panel mount, „pulse variation mod”
2	Push button	OFF – (ON) / normally open	AUTOTRIGGER ON/OFF, HUMANIZER ON/OFF

4. Front panel wiring (view from behind)

CLAPSNAP front panel wiring



NC = NOT CONNECTED

OUT = SOLDER POINT ON PCB

GND = GROUND

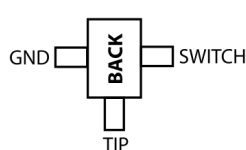
+V = POSITIVE POWER SUPPLY

Potentiometer

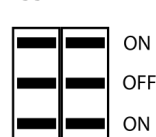


A = log
B = lin

Jack socket



Toggle switch



Push button switch



Illustration 7: Front panel wiring, vector graphics

Remarks on front panel wiring:

- There are 2 additional caps wired od front panel (incuded in BOM), they perform a „pulse variation mod”; of course, you can skip them (and switch), they were not included in original circuit.
- I skipped the „autotrigger speed LED”, „manual trigger switch” and „foot trigger input ” they are not mounted on front panel (look at the schematics to find out more).
- „Autotrigger on / off” and „humanizer on / off” are simple temporary ON switches.

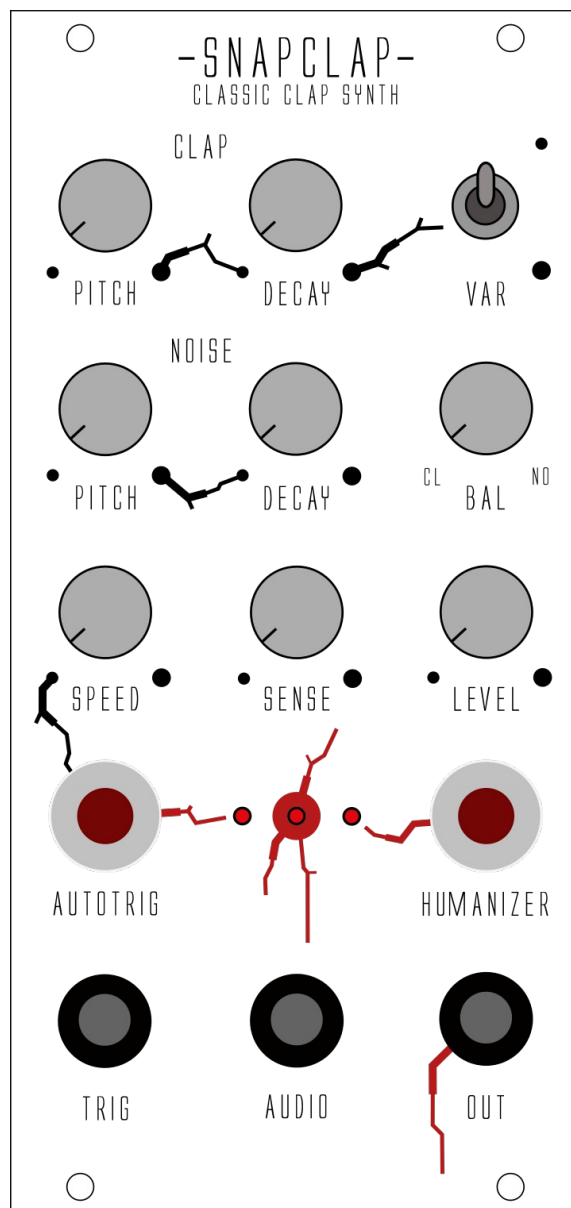


Illustration 8: Front panel example, vector graphics

5. First run

It's always a good practice to check voltages before inserting IC's. The following diagram can help. Notice:

- white stripe near EURO connector means „connect negative rail here” (something like red stripe on euro ribbon cable),
- device will work also on +/- 15 V (knobs can has slightly different response).

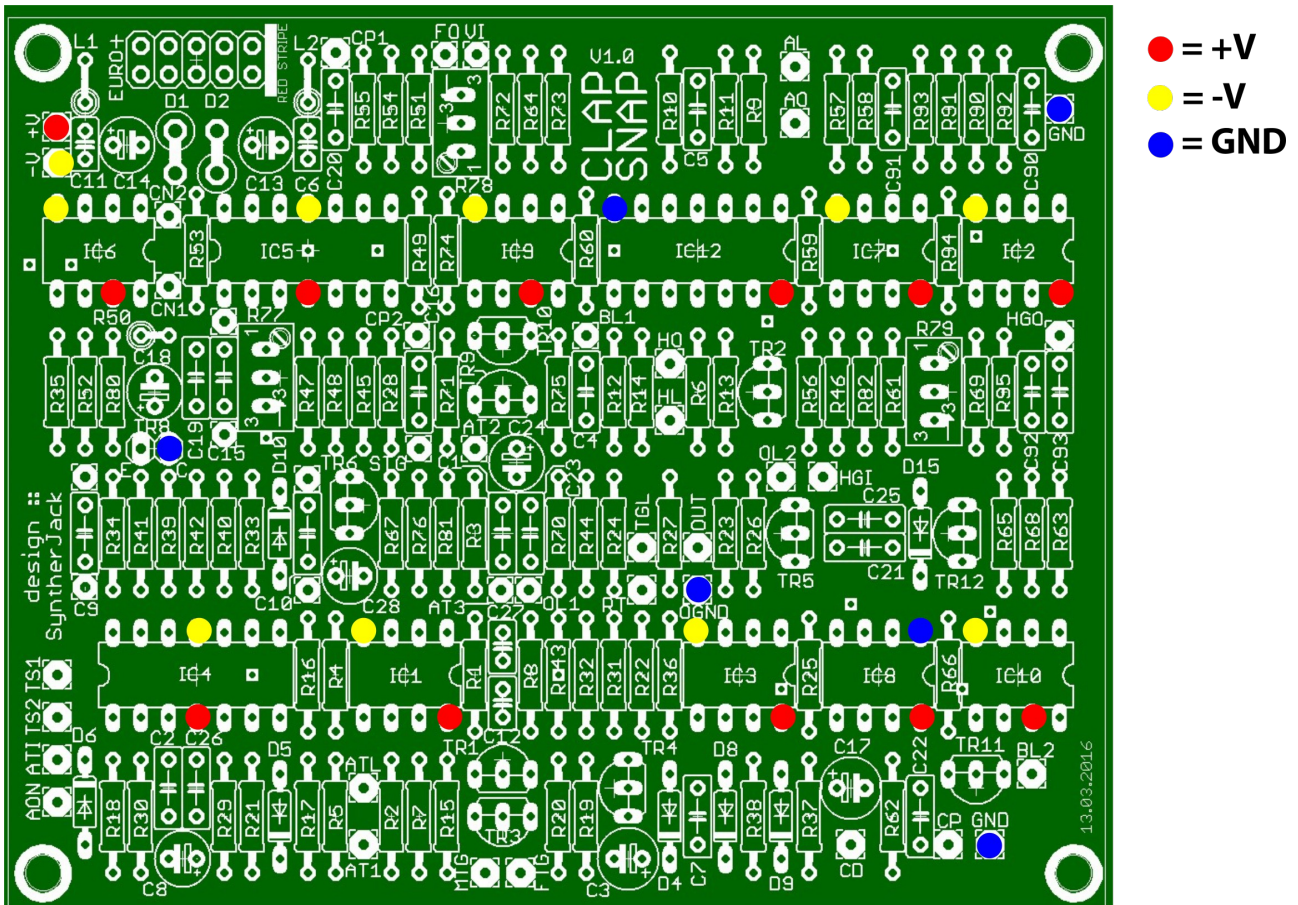


Illustration 9: ClapSnap voice board voltages

Check one more time panel wiring, insert ICs and check its polarity Set the 3 pots on PCB:

- VCA TRIM (R79) – set maximum reasonable output volume (try not to blow your speakers), set BALANCE to full clap (ensemble), tweak trimmer for maximum output level and minimum VCA leaking when no trigger is applied,
- NOISE VOLUME (R77) – set BALANCE in center position, set trimmer to get noise as loud as clap (ensemble),
- FILTER RESONANCE (R78) – set BALANCE full noise, tweak trimmer to get hi resonant feel while sweeping NOISE PITCH.

In case of any problems, use schematics for troubleshooting. There is a lot more of additional info included.

5. Finished module example

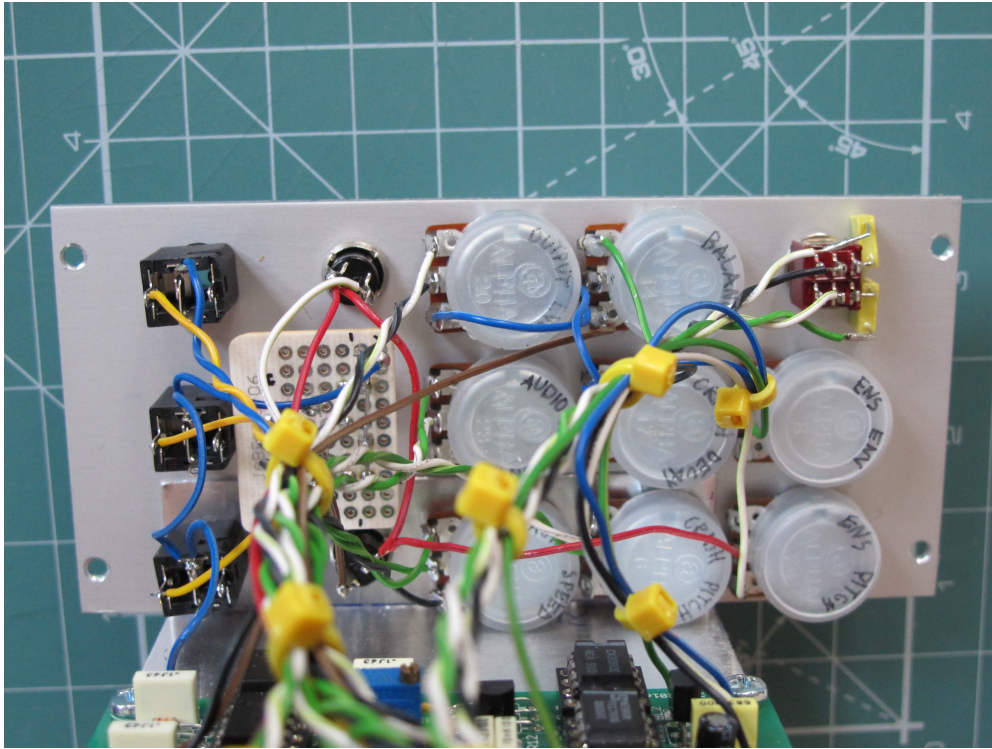


Illustration 10: ClapSnap voice reference build, back view

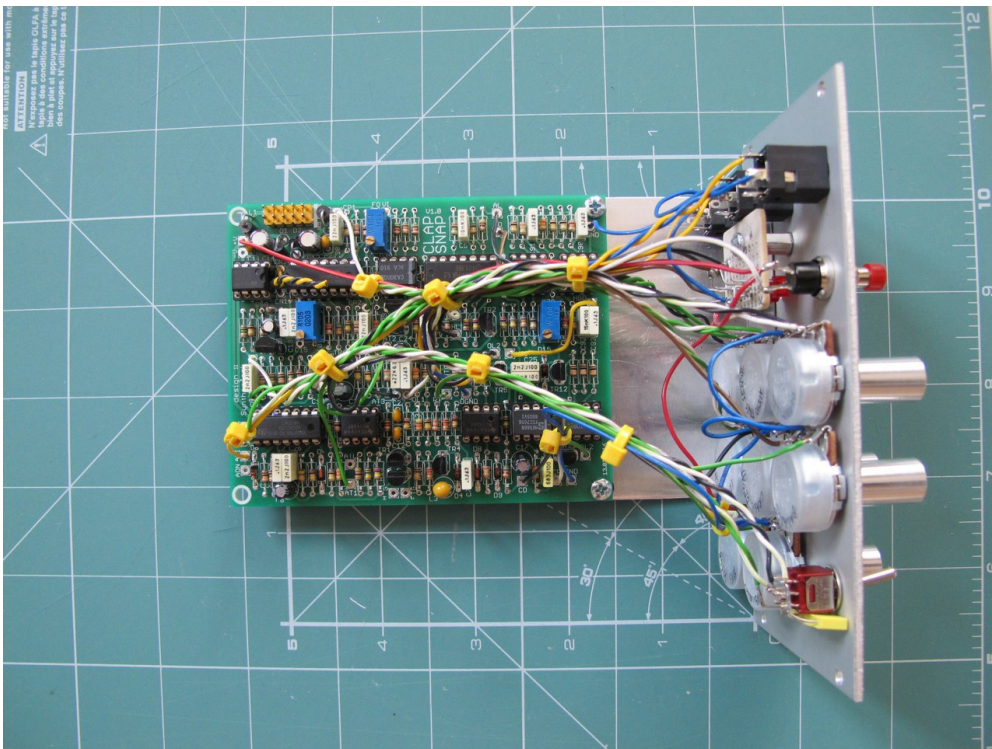


Illustration 11: ClapSnap voice reference build, top view

