# HC-2 handclap synthesizer DIY project



v1.01 VEGE A-HC-2 HAND CLAPPER BURST NOISE NOISE TRIG OUT

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## 1. Introduction

If you are expecting to hear a natural sounding handclap, it is definitely wrong place to start. This one is somehow similar to 808 HC, but uses digital noise source instead of analog. Owning a handclap synthesizer can be you first step in becoming electro or hardcore-techno producer!

### What's interesting in this project:

- fat sounding handclap,
- modified noise generation circuit with variable digital noise clock source,
- variable impulse count in noise volume envelope (1 to 4 pulses).

### 2. General information

#### **Controls:**

- dry (noise color),
- clock (noise source clock speed),
- burst (pulse count in noise envelope),
- hall ("fake" echo volume),
- output level.

#### I/O:

- trigger in,
- noise out,
- drum out,
- trigger LED.

#### Power consumption - maximum

- 15 mA @ +12V, 0mA @ -12V
- 15 mA @ +15V, 0mA @ -15V
- only positive rail is used!

# 3. PCB information

PCB is one-sided, 80x100mm.

PCB is designed for some more modifications:

- burst delay (delay between pulses in noise envelope),
- filter tuning change with additional switches.



Illustration 2: SDSV PCB TOP side view, vector graphics

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

Point on PCB	Description	Notes	
MD1	Filter tuning change	You can add switch with additional cap to have variable filter tuning	
MD2	Filter tuning change		
MD3	Filter tuning change	You can add switch with additional cap to have variable filter tuning	
MD4	Filter tuning change		
MD5	"Burst count" mod	Already included in BOM	
MD6	"Burst delay" mod	<b>Not</b> used by default (boooring)	
MD7	"Burst delay" mod		
MD8	Clock source speed mod	Already included in BOM	
MD9	Clock source speed mod	speed mod	
DRY1	Connect DRY potentiometer here		
DRY2	Connect DRY potentiometer here		
FN	Filtered noise output		
HAL1	Connect HALL potentiometer here		
HAL2	Connect HALL potentiometer here		
HAL3	Connect HALL potentiometer here		
OGND	Additional GROUND point for handclap output		
OUT	Handclap output if output pot <b>is not used</b>	Not used by default	
TRG	Trigger input		
VA	Virtual GROUND	About 5V over GND	
VOL1	For 808 style volume control	Not used by default	
VOL2	For 808 style volume control		
VOL3	Handclap output if output pot <b>is used</b>	Already included in BOM	
LED	Trigger LED output	Cathode	
GND	Signal GROUND		
+V	Positive power supply	Regulated 9V	



Illustration 3: TOP view of the PCB, photo



Illustration 4: BOTTOM view of the PCB, photo

Below picture of PCB design and soldered HC-2 handclapper PCB (DIY etched) in shown . What you should notice:

- wire clamp (marked red on PCB printscreen) under IC2, IC7, between IC4 and IC5, 2 next to Q3 / C23 5 wire clamps in total; solder them in the first place!
- do not solder R1, R7, R15 (they are replaced by mod), kept for backward compatibility,
  - $\circ~$  R1 and R15 are replaced with "output level" pot ,
  - R7 is replaced with "burst" pot,
- look out for BA6110 polarity, pin 1 is marked with dot!
- two small holes in top and bottom left corner are "mod holes" if you solder wire to the bottom of PCB and want lead it to front panel, you can pass thru this hole to secure it,
- **not** all ICs in a row go in the same direction, be careful,
- the only things to tweak on PCB are 2 pots (BIAS and SENSE) "set and leave" controls (check schematics or "First run" chapter for description).



Illustration 5: HC-2 handclapper PCB design, final version 1.0



Illustration 6: Soldered HC-2 PCB (DIY etched), final version 1.0



Illustration 7: Soldered HC-2 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 is for protection, 1N4004, 1N4007 or similar will work,
- the only rare component is BA6110,
- use 1x4 or 2x5 EURO connector,
- 2MB potentiometer (2 megaohm, linear) can be replaced with dual 1MB potentiometer.

Qty	Value	Description	Parts	
Resistors				
4	1M	Resistor 1/4 W, 5%	R6, R19, R33, R65	
5	1k	Resistor 1/4 W, 5%	R8, R9, R56, R60, R66	
1	1k5	Resistor 1/4 W, 5%	R100	
1	1k8	Resistor 1/4 W, 5%	R17	
2	2k7	Resistor 1/4 W, 5%	R13, R22	
5	4k7	Resistor 1/4 W, 5%	R26, R28, R36, R37, R55	
1	5k6	Resistor 1/4 W, 5%	R25	
1	8k2	Resistor 1/4 W, 5%	R18	
8	10k	Resistor 1/4 W, 5%	R11, R20, R42, R43, R46, R53, R57, R58	
3	15k	Resistor 1/4 W, 5%	R4, R21, R39	
3	22k	Resistor 1/4 W, 5%	R24, R52, R59	
2	33k	Resistor 1/4 W, 5%	R44, R48	
3	39k	Resistor 1/4 W, 5%	R23, R31, R38	
4	47k	Resistor 1/4 W, 5%	R16, R32, R50, R61	
1	56k	Resistor 1/4 W, 5%	R14	
2	68k	Resistor 1/4 W, 5%	R10, R12	
1	82k	Resistor 1/4 W, 5%	R2	
1	100R	Resistor 1/4 W, 5%	R49	
7	100k	Resistor 1/4 W, 5%	R30, R35, R40, R45, R51, R62, R67	
1	150k	Resistor 1/4 W, 5%	R29	
3	220k	Resistor 1/4 W, 5%	R27, R47, R54	
1	240R	Resistor 1/4 W, 5%	R101	
1	330R	Resistor 1/4 W, 5%	R5	
1	390k	Resistor 1/4 W, 5%	R3	
1	470k	Resistor 1/4 W, 5%	R41	
3		do not mount on PCB	R1, R7, R15	
	-	Potentiomete	rs	
1	100kA	Potentiometer audio taper	panel mount, OUTPUT LEVEL	
2	100kB	Potentiometer linear taper	panel mount, CLOCK, DRY	
1	10kB	Potentiometer linear taper	panel mount, HALL	
1	2MB (dual 1MB)	Potentiometer linear taper	panel mount, BURST	
2	10kA	PCB trimmer potentiometer	VR1, VR2	

#### Table 2. Bill of materials

Capacitors					
2	1n	Film capacitor	C4, C5		
3	10n	Film capacitor	C20, C24, C26		
1	22n	Film capacitor	C21		
1	27n	Film capacitor	C3		
1	47n	Film capacitor	C9		
1	100n	Film capacitor	C12		
1	470n	Film capacitor	C22		
1	680p	Film capacitor	C17		
5	100n	Ceramic capacitor	C18, C27, C28, C30, C31		
1	100p	Ceramic / film capacitor	C11		
1	220p	Ceramic / film capacitor	C19		
1	330p	Ceramic / film capacitor	C10		
4	10n	Ceramic capacitor	C15, C25, C29, C101		
2	0.47u	Electrolytic capacitor	C2, C16		
4	1u	Electrolytic capacitor	C1, C7, C13, C205		
2	4u7	Electrolytic capacitor	C8, C23		
1	10u	Electrolytic capacitor	C100		
2	100u	Electrolytic capacitor	C6, C14		
Semiconductors					
		Semiconduc	aurs		
1	1N4004	Generic silicon diode	D1		
1 8	1N4004 1N4148	Generic silicon diode Generic silicon diode	D1 D2, D3, D5, D6, D7, D8, D9, D10		
1 8 1	1N4004 1N4148 5.1V	Generic silicon diode Generic silicon diode Zener diode, 5.1 V	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4		
1 8 1 1	1N4004 1N4148 5.1V 4006N	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4		
1 8 1 1 1	1N4004 1N4148 5.1V 4006N 4070N	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5		
1 8 1 1 1 1	1N4004 1N4148 5.1V 4006N 4070N BA6110	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare)	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8		
1 8 1 1 1 1 6	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11		
1 8 1 1 1 1 6 5	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9		
1 8 1 1 1 1 6 5 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1		
1 8 1 1 1 1 6 5 1 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2		
1 8 1 1 1 1 6 5 1 1 3	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7		
1 8 1 1 1 1 6 5 1 1 3	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 Misc	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7		
1 8 1 1 1 1 6 5 1 1 3 3	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 L-EU0207/10	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <u>Misc</u> Bead inductor	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1		
1 8 1 1 1 1 6 5 1 1 3 3 1 1 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 L-EU0207/10 MTA04-156	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <u>Misc</u> Bead inductor Connector 1x4 (MOTM)	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1 J1		
1 8 1 1 1 1 6 5 1 1 3 3 1 1 1 1 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 LEU0207/10 MTA04-156 PINHD-2X5	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <u>Misc</u> Bead inductor Connector 1x4 (MOTM) Connector 2x5 (EURO)	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1 J1 J1		
1 8 1 1 1 1 6 5 1 1 3 3 1 1 1 1 3	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 L-EU0207/10 MTA04-156 PINHD-2X5 Jack socket	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <u>Misc</u> Bead inductor Connector 1x4 (MOTM) Connector 2x5 (EURO) Without switch	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1 J1 J1 JP1 panel mount		
1 8 1 1 1 6 5 1 1 3 7 1 1 3 1 1 3 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 L-EU0207/10 MTA04-156 PINHD-2X5 Jack socket LED	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <b>Misc</b> Bead inductor Connector 1x4 (MOTM) Connector 2x5 (EURO) Without switch Trigger LED – color of choice	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1 J1 JP1 panel mount panel mount		
1 8 1 1 1 5 5 1 1 1 3 1 1 3 1 1 3 1	1N4004 1N4148 5.1V 4006N 4070N BA6110 BC546 BC556 LM317LZ LM339 LM358 L-EU0207/10 MTA04-156 PINHD-2X5 Jack socket LED IC sockets	Generic silicon diode Generic silicon diode Zener diode, 5.1 V Shift register IC, DIP14 EX-OR gate IC, DIP14 VC-OPAMP, SIP9 (rare) Generic transistor Generic transistor Voltage regulator, TO92 Quad comparator IC, DIP14 OPAMP, DIP8 <u>Misc</u> Bead inductor Connector 1x4 (MOTM) Connector 2x5 (EURO) Without switch Trigger LED – color of choice	D1 D2, D3, D5, D6, D7, D8, D9, D10 D4 IC4 IC5 IC8 Q3, Q4, Q6, Q7, Q10, Q11 Q1, Q2, Q5, Q8, Q9 IC1 IC2 IC3, IC6, IC7 L1 J1 JP1 panel mount panel mount		

### 4. Front panel wiring (view from behind)





+V = POSITIVE POWER SUPPLY CONNECTION

**GND = GROUND CONNECTION** 

B = lin

### Remarks on front panel wiring:

- V+ and MD5 points are where R7 resistor was (now its replaced with pot),
- VOL1 and VOL2 are not used by default they can be useful if you want to add 808-like volume control (just check 808 bass drum schematics for example).



*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:

- 12V input voltage is lowered to 9V, so +V = 9V,
- VA = ~5V (virtual ground),
- white stripe near on MOTM / EURO connector means "connect negative rail here" (something like red stripe on euro ribbon cable).



Illustration 9: HC-2 voice board voltages

Check one more time panel wiring, insert ICs and check its polarity (BA6110 – white dot = pin 1), power the circuit. Set the 2 pots on PCB:

- SENSE half ot its value will be a good starting point just rotate until you hear response to trigger,
- BIAS set maximum reasonable output volume (try not to blow your speakers), give some trigger and set BIAS pot to minimum noise while untriggered.