

circuitbenders.co.uk drumBs build guide

Read the ENTIRE guide before starting work. This guide is for the standalone module version of the drumBs board. The guide for the eurorack version can be found on the circuitbenders site.

The circuitbenders.co.uk drumBs PCB is a tweaked version of the Syntom II, which was an analogue percussion project first published nearly four decades ago in the April 1983 edition of the mighty Electronics & Music Maker Magazine. **ALL HAIL E&MM!**

The drumBs PCB can create a wide range of basic analogue percussive sounds. Essentially these are the kind of sounds that relate to modern drum machines like an Analog Rytm, Alpha Base or Tempest in the same way as a Commodore 64 relates to the latest Apple Mac. On paper its shit in comparison, but it's cheap and fun, and theres a certain dirty DIY magic to it! The drumBs synth section features both a VCO and a noise source, along with a resonant noise filter and an auto roll function. It can be built in both a Eurorack or standalone format.

The standalone drumBs controls are:

SENSITIVITY: Optional trigger sensitivity if you're using a drum pad or piezo trigger of some sort.

DECAY: The decay of the percussion envelope.

BEND: The depth of percussion envelope applied to the pitch of the VCO and the filter cutoff of the noise source.

PITCH: The basic pitch of the VCO.

CUTOFF: The cutoff frequency for the noise filter.

REZ: The resonance of the noise filter.

PULSE: The level of an initial clicking attack at the start of the percussion sound .

MIX: The mix between the oscillator and the noise source.

ROLL: The repeat rate of the auto roll function.

VOLUME: Unsurprisingly is a volume control

TRIGGER INPUT: The trigger input accepts a standard +5v trigger pulse or gate to trigger the module.

AUTO ROLL SWITCH: The auto roll switch activates the auto roll function whenever the switch is closed. When the auto roll function is activated the board will automatically retrigger itself at a rate set by the roll knob for as long as the switch is closed. This can be very useful for creating unusually timed fills and rolls, although at its highest trigger rate the roll function can sound like a constant VCO tone.

OUTPUT: You can probably work this one out for yourself.

PARTS LIST

PART NUMBER	PART VALUE	NOTES
D1, D2	1N4148	Diode
D3	1N5817	Polarity protection diode
R19	680R	All resistors standard 1/4 watt carbon or metal film
R6, R7, R12, R13, R32, R33 R42	1K	
R3, R9, R14, R18, R28, R35	4.7K	
R8, R29, R37, R38	10K	
R11, R21, R25	22K	
R36	15K	
R2, R5, R16, R20, R24, R26 R27, R34, R41	47K	
R31	75K	
R15, R30, R39, R43	100K	
R1, R10, R22, R23	150K	
R40	470K	
R4, R17	2.2M	
C16	100nF	Ceramic
C2, C3	1nF	Poly Film

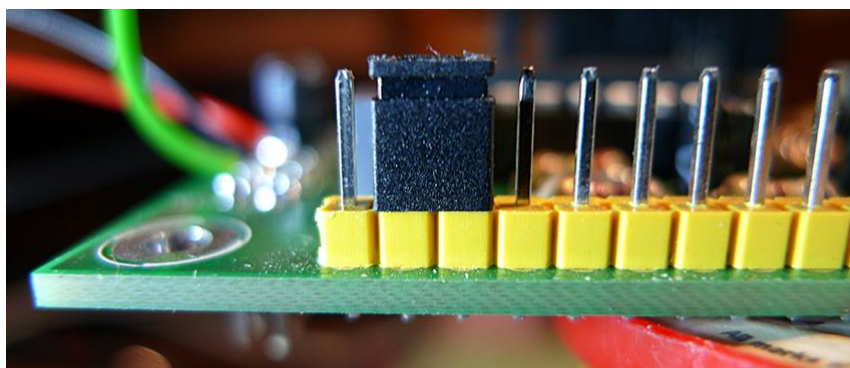
C17	2.2nF	Poly Film
C1	10nF	Poly Film
C4	22nF	Poly Film
C5	47nF	Poly Film
C9, C15	100nF	Poly Film
C6, C10, C11, C12, C13	1uF	Electrolytic
C8	4.7uF	Electrolytic
C7	22uF	Electrolytic
C14	220uF	Electrolytic
IC1	TL072	Op Amp
IC2	LM324	Quad Op Amp
IC3	LM13700	OTA
IC4	LM13700	OTA
Q1	BC108B	Noise transistor*
J1	47K	Resistor to set the output level**
NOISE ADJ	100K trimmer	
Headers	11 pin	2.54mm pin header optional***
Headers	11 pin	2.54mm pin header optional***
Headers	4 pin	2.54mm pin header optional***
Sensitivity	A47K	Potentiometer optional****
Decay	A500K	Potentiometer
Bend	B100K	Potentiometer
Pitch	A100K	Potentiometer
Filter Cutoff	A100K	Potentiometer
Resonance	A1M	Potentiometer
Pulse	A1M	Potentiometer
Mix	B100K	Potentiometer
Volume	B47K	Potentiometer
Roll	B500K	Potentiometer
Jack	6.35mm or 3.5mm	Trigger Input Jack
Jack	6.35mm or 3.5mm	Audio Output Jack
LED	5mm LED	Trigger LED

*The BC108B is commonly available in a metal can package and so that footprint is on the PCB. Other package versions can also be used as long as the pinout is matched to the PCB markings.

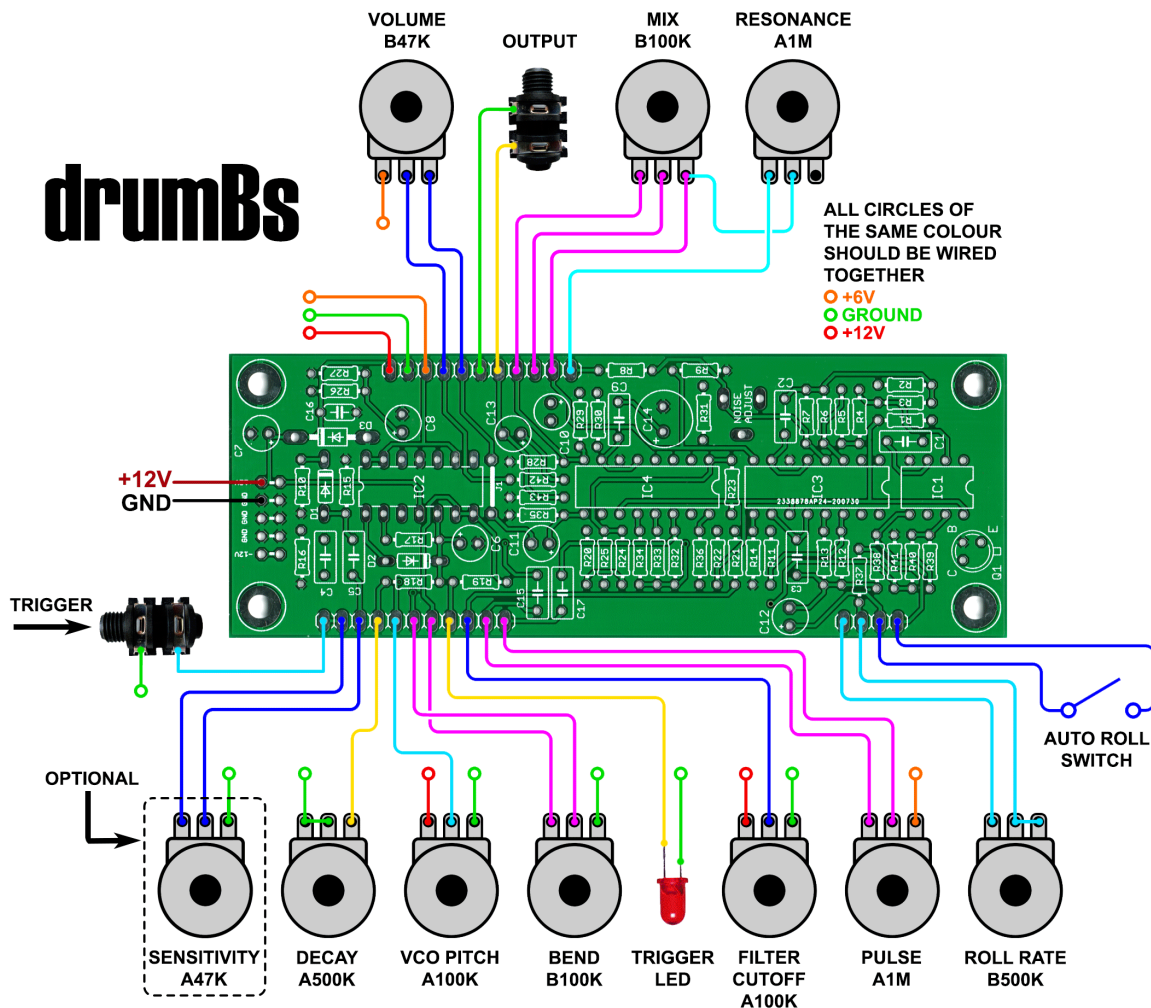
**On the eurorack version this resistor at J1 is a wire jumper. Installing it on the standalone version takes the output down to normal line level.

***You can use header pins or just wire the pots straight to the board

****The sensitivity pot is arguably useless if you are using standard +5v triggers, but has been included as an option as it may serve some purpose if you are triggering the board using an old drum pad or piezo trigger. If you leave this pot out then you must bridge the two solder pads it connects to at the board using a header jumper or just shorting the pads with a piece of component leg.



Pots, power and jacks wiring diagram.



All the small circles of the **same colour** shown on the diagram above should be wired together i.e. the red circles are the 12v power rail connections, so pin one of the VCO Pitch pot and pin one of the Filter Cutoff pot should both be wired to 12v at pin one of the header on the top left of the board as shown above . All the green circles represent ground so they should all be wired together and then connected to pin 2 of the pin header on the top left of the board, etc etc.

If you are mounting the pots on a panel it is a lot easier to wire all the 12v, 6v and ground connections from pot to pot at the panel and then take one wire to the board, than it is to wire each connection to the board individually. Don't forget the connections between two pot pins on the Decay and Roll Rate pots.

Power: The board should be powered using +12v at the solder pads for the eurorack type power connector on the left. You only need to connect one of the +12v pads and one of the GND pads as shown on the diagram above

Output Jack: The output jack can be wired to the main PCB using shielded audio cable. A ground pad has been provided next to the output pad to solder the cable shield to.

Adjusting the noise trimmer: The noise trimmer allows you to adjust the frequency response of the noise filter for the minimum amount of crackle or low end white noise. How you adjust it is a matter of personal taste, but we've found its best to turn both the filter resonance and cutoff up to maximum. Then with the mix set fully clockwise, the bend set to zero and the decay set to maximum, trigger the module and adjust the noise trimmer until the crackle just disappears and you hear nothing but smooth noise.

Clicks: As with any analogue synth with a very fast attack envelope, you will sometimes experience clicks at the start of the sound. This mainly only happens with low frequency oscillator sounds and is caused by the envelope opening more or less instantly at a point where the VCO waveform is not crossing zero. This will vary in intensity depending on where the VCO is in its cycle when the envelope opens. With this basic circuit it is unavoidable, but it can be mitigated to some extent using the pulse control to make the click more regular and predictable. In general use you may not even notice it.

Filter Cutoff / Noise Pitch: Due to an administrative fuck up the filter cutoff connection pin is labelled as 'Noise Pitch' on the PCB. This is because that's what it's called on the Syntom II schematic, and some idiot forgot to change it on the board. Rest assured those responsible have been severely punished!

Auto Roll Switch: This can be any kind of switch or button that will close the contacts across the auto roll switch pins. If you want to do it using an external gate signal like on the eurorack version you can build the circuit below using a 4066 CMOS switch. The output should be wired across the auto roll switch pins. You can source the 6V from the +6V pin on the main board.

There's probably other ways of doing it, but for some reason we went with this version and have no recollection of why! Maybe it just seemed like a good idea at the time.

