---VOLTAGE RUNNER---

Diodes (mind direction!)

D1/D2/D3/D4/D5/D6/D7/D8	1N4148
D9/D10/D11/D12/D13/D14	BAT43 (mind that D13 is facing left)
D15/D16	1N4001 (mind that D15 facing down)

Resistors

R1/R2/R3	3.6K (orange-blue-red)
R4/R5/R6/R7/**R18**	10K (brown-black-orange)
R8/R9/R10/R16	1K (brown-black-red)
R11/R12/R13/R14/R15	22K (red-red-orange)

Capacitors

C1/C2/C4/C6/C7/C10/C11	100nF
C5	330nF
C9	680pF
C12/C13	10uF (mind direction! "–" = square pad)

Voltage regulator (mind direction!)
78L05

Transistors (mind direction!)

Q1/Q2/Q3	BC547

IC sockets (mind direction!)
TL072
Attiny48

Trimmer

1K	multiturn trimmer

Power header (mind direction!)

10 pin	boxed header

LEDs, Potentiometers, jack sockets and switches

<u>Place the components and frontpanel before soldering</u>

After placing all components place the frontpanel and make sure all components are lined out before soldering! You might want to use some tape over the switches and LEDs to keep them in place. The LEDs have a flat top, so it is most beatiful to keep the top flat with the frontpanel. To achieve this you can first solder just one leg and rehead it to line out (this works for the switches as well).

8x LEDs (mind direction!)	square pad is long leg of the LED!
P1/P2/P3/P4/P5/P6/P7/P8	10K inversed log **C**
P9/P10	10K lin **B**
P11/P12	10K lin **B** D-shaft
jack sockets	
switches	

Setting up

The trimmer is mostly only used when the Voltage Runner is used in combination with the TTLFO.
The trimmer sets the max readed input voltage and can be set to roughly between 4.7V and 5.3V.
To set the trimmer to your TTLFO, set the TTLFO in the following settings:

shape:	Saw up
multiplier:	can be anything as long as the clock is slow
shape/distort:	12 o'clock

Set the Voltage Runner with start point 1 and play length 8.
listen to the pulse output while turning the trimmer till the pulses are all in the same timing.