

Haible Living VCOs by RANDOM*SOURCE 2015 -

All values for +/-15V operation -
 values in (round brackets) are suggestions for +/-12V
 (version 2015-12-16)

1	10p	C37	COG/NP0 recommended
4	22p	C5A, C5B, C5C, CM1	COG/NP0 recommended
5	100p	CD27, CD30, C1, C12, C25	COG/NP0 recommended
4	1nF	CD1, C2A, C2B, C2C	COG/NP0 recommended
3	2n7	C3B, C3Q, C3S	Polystyrene / Styroflex
1	47n	CD31	
7	100n	CB1, CB2, CB3, CB4, CB5, CB6	Bypass Caps - not (all) needed if SMT Bypass caps are installed
1	100n	CD28	COG/NP0 recommended
10	1uF	C6A, C6B, C6C, CT2A, CT2B, CT2C, CTA, CTB, CTC, CD29	Film (WIMA MKS2-5 or similar)
2	10uF	C1P, C2P	POLARIZED CAPACITOR, 25V or higher rated
6	22u	C7, C8, C15, C16, C27, C28	POLARIZED CAPACITOR, 25V or higher rated
24	1N4148	D1A, D1B, D1C, D2A, D2B, D2C, D3A, D3B, D3C, D4A, D4B, D4C, D15A, D15B, D15C, D16, D18, D19, DT1, DT2, DT3, DT4, DT5, DT6	DIODE
2	5V1	D17, D20	ZENER DIODE
12	BC550C	Q3A, Q3B, Q3C, Q4, Q4A, Q4C, Q5A, Q5B, Q5C, Q7A, Q7, Q7C	NPN Transistor, Q3, Q4: Rectangular pad = Emitter
12	BC560C	Q1A, Q1B, Q1C, Q2A, Q2B, Q2C, Q6A, Q6B, Q6C, Q28, QD22, QD23	PNP Transistor
3	BC847C	Q9, Q9A, Q9C	IGNORE (SMT ALTERNATIVE TO Q7)
6	BCM847DS	T1, T2, T4, T5, T7, T8	NXP BCM847 Transistor Array - BOTTOM SIDE!! USE BCM847DS OR THAT300 - NOT BOTH!!!
3	THAT300S	Q8A, Q8B, Q8C	ALTERNATIVE TO BCM847DS (T1, T2, T4, T5, T7, T8) - DO NOT USE BOTH!
3	PMP4201Y	QM, QM1, QMC	IGNORE (NXP PMP4201Y AS ALTERNATIVE TO Q4, Q5)
3	SSM2212RZ	QSSMA, QSSMB, QSSMC	IGNORE (\$\$\$ SMT ALTERNATIVE TO Q4, Q5)
1	LM13700N	UD1	OTA
3	LM311N	IC2A, IC2B, IC2C	COMPARATOR
4	OPA2134P	UD5, IC7A, IC7B, IC7C (= IC7, IC10, IC12)	Burr-Brown Op-Amp
1	TL072 (OPA2134)	UD4	Burr-Brown Op-Amp

5 TL072	UD2, UD3, IC1, IC1A, IC1C	OP AMP
3 TL074	IC3A, IC3B, IC3C	OP AMP
1 1k tempco	R11A, R11B, R11C	Tempco 3000ppm/K ... 3500ppm/K - Mount on Top of Transistor Array (THAT300 or BCM847DS)
8 BEAD	L1A, L1B, L1C, L2A, L2B, L2C, FD1, FD2	FERRIT BEAD
1 68R	R121	
1 100R	R119	
2 220R	R127, R129	
4 300R	R35A, R35B, R35C, R148	
3 330R	R17B, R17C, R49	
3 390R	RS4B, RS4C, RS10	
18 1k	R23A, R23B, R23C, R27A, R27B, R27C, R29A, R29B, R29C, RA5X, RA5Y, RA5Z, R131, R143, RM6, RA4A, RA4, RA4C	
3 1M(820k/5 10k)	R39A, R39C, R39B	R39A and R39X are in series to allow easier adjustment of the PULSE WIDTH RANGE for a specific value. For 15V using 1M + 100R (or 10R) equals Jürgens original value. I used 820k + 0R/Link for 12V. (Same with R39B + R39Y etc.) See R39A ... Above
3 10R/LINK	R39X, R39Y, R39Z	
1 1k5	R124	
3 2k(1k8)	R12A, R12B, R12C	
3 2k(1k96?)	R25A, R25B, R25C	
7 2k2	RS1A, RS1B, RS1C, RS6, RS6A, RS22, R123	
3 3k3	R19A, R19B, R19C	
3 5k1(4k7)	R24, R24A, R24C	
3 6.2k	R30A, R30B, R30C	
35 10k	R6A, R6B, R6C, R16A, R16B, R16C, R21A, R21B, R21C, RA, RB, RC, RS2A, RS2B, RS2C, RS5, RS5A, RS7, RS7A, RS8A, RS8B, RS19, RS23, RS24, RT6A, RT6B, RT6C, RT7A, RT7B, RT7C, R147, R149, R153, R154, R157	
3 12k(10k)	R34A, R34B, R34C	

17 15k R20A, R20B, R26A, R26B,
R26C, R28A, R28B, R28C,
R31A, R31B, R31C, R96, RA1X,
RA1Y, RA1Z, R125, R156

1 15k(10k) R150
3 20k(47k) R22A, R22B, R22C
21 20k RA1, RA1A, RA1C, RA2, RA2A,
RA2C, RA2X, RA2Y, RA2Z,
RA3X, RA3Y, RA3Z, RT1A,
RT1B, RT1C, RT2A, RT2B,
RT2C, RT5A, RT5B, RT5C

3 20k(33k) R33A, R33B, R33C
1 22k R130
3 51k R10A, R10B, R10C
1 56k R155
6 62k RA3, RA3A, RA3C, RA4X,
RA4Y, RA4Z

3 68k R13A, R13B, R13C
19 100k R4A, R4B, R4C, RT8A, RT8B,
RT8C, R120, R122, R128,
R137, R141, R144, R151,
R158, RM1, RM2, RM3, RM4,
RM5

11 100k .1% R1A, R1B, R1C, R2A, R2B, R2C,
R3A, R3B, R3C, R145, R146

Resistors, 0.1% - you can also use 1% and match them in pairs or triples. You should match all resistors that go from CV inputs to one node, like R1A, R2A, R3A. Similarly R1B, R2B, R3B etc.. Finally, R145, R146. There is no need to match between these groups.

1 100k(75k) R160
6 150k(120k) R5A, R5B, R5C
R38A, R38B, R38C

(12V only: some people suggest 270k instead of 120k, to me it looks like 120k make sense)

1 200k R159
1 220k R161
6 300k RT3A, RT3B, RT3C, RT4A,
RT4B, RT4C
1 430k(150k) R140

1 510k R152
3 510k(390k) R7A, R7B, R7C

3 750k(1M5) R36A, R36B, R36C
12 1M R15A, R15B, R15C, R32A,
R32B, R32C, R37A, R37B,
R37C, R126, R139, R142

1 4.7M R138
3 10M R14A, R14B, R14C

Check size of footprints for trimmers to see if they fit!

10 100k	OCT_DOWN, OCT_UP, RND, RND1, RND2, TRI-LEVEL, TRI-LEVEL1, TRI-LEVEL2, VCA, VCA-CV	Trimpot (3362P) or small Multiturn
3 100k	TR8-FREQ, TR8-FREQA, TR8C-FREQ	Multiturn-Trimpot S64YW
3 10k	TR9A-SCALE, TR9B-SCALE, TR9C-SCALE	Multiturn-Trimpot S64YW
3 2K	TR18-HF, TR18-HF1, TR18-HF2	Trimpot (3362P) or small Multiturn
6 50k	R40T1, R40T2, R40T3, SYMMETRY, SYMMETRY1, SYMMETRY2	Trimpot (3362P) or small Multiturn