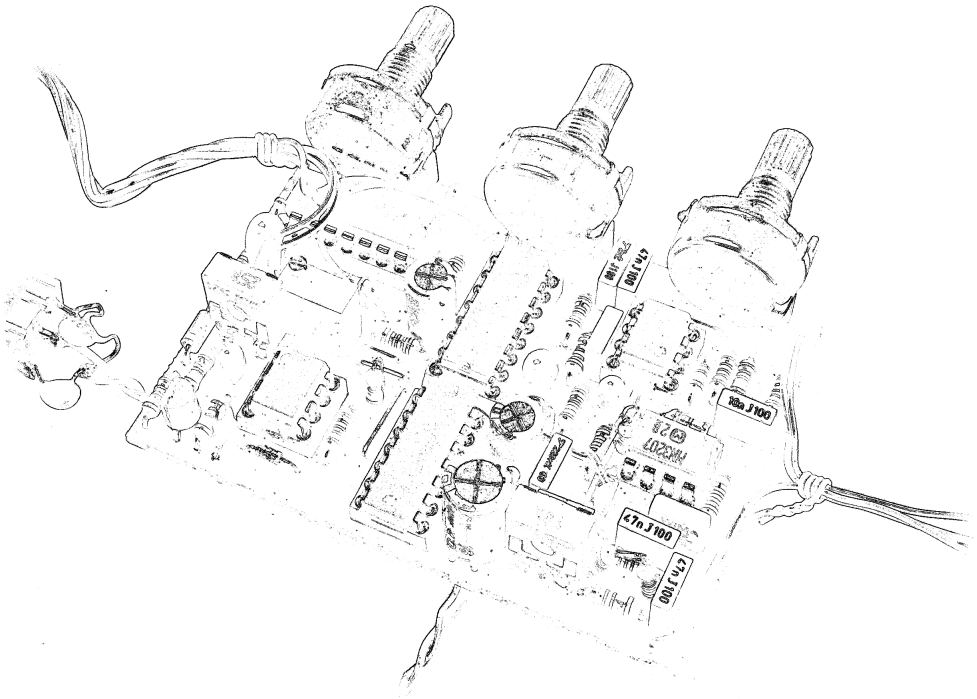
THOMEEQUE'S EM3207 (v1.1)

MN3207 based EHX Electric Mistress (9V) clone



BUILD INSTRUCTIONS
DRAFT1

Thomeeque, 2011-06-03

INTRODUCTION

EM3207 is a loose clone of the original 9V EHX Electric Mistress chorus/flanger adapted for MN3207 BBD chip.

Additionally it features:

- **Unity gain** (no volume drop compared to true-bypass) without need of additional amplification,
- **Input RF filter** to avoid interferences between internal clock and AM radio rubbish picked from the air,
- **Improved VCC filtering** for LFO section to lower danger of LFO ticking leaking into the audio signal via supply tracks.

BUILD NOTES

1. Use sockets for all ICs as layout expects it, precise type.
2. Solder all direct jumpers first, some of them start/end under IC sockets, it would be problematic to install them if sockets were already there.
3. Next solder all laying diodes and resistors, then sockets, then small caps etc. Simply go from the lowest to the highest components.
4. Long jumpers (feedback jumper and clock jumpers) solder when all parts are placed on the PCB (twist clock jumpers together and lead them shortest possible way - you can switch them, it does not matter which one ends at CP1 and which one at CP2).
5. FLAGE / FILTER-MATRIX mode switch (SW_MODE) is wired off-board, see schematic.
6. Rest of off-board wiring (IN/OUT jacks, switching, DC jack etc.) is not covered by this document, usual true-bypass switching and stompbox wiring is expected.
7. It can be problematic to get 1M/EXP (reverse-audio) potentiometer for POT2_RATE, I usually use 1M/LOG (audio) pot with reversed function in these situations instead. PCB therefor leaves middle lug of this pot unconnected to be ready for both scenarios. Jumper must be soldered to connect pot's middle lug with one of outer lugs, depending on the pot type (as indicated on the layout pictures).
8. If wiring potentiometers off-board, keep leads to them as short as possible, especially those leading to the RATE pot generate lot of electromagnetic hum. For the same reason try to lead audio signal wires and place IN/OUT jacks as far from LFO&Clock circuitry as possible. If you still get ticking into the signal, you can try to introduce some shielding there.
9. Between power pins of each of ICs should be at the bottom (solder) side of PCB soldered 100nF ceramic filtering capacitor (not drawn on schematics) for enhanced VCC filtering.
10. Do as many partial checks as possible (layout is very tight and circuitry has already some level of complexity, so try to avoid potential future debugging until it's easy yet):
    - Check new etched PCB traces for cuts and bleeds,
    - Check that all direct jumpers are there before proceeding with soldering of the components,
    - Check all resistor values by DMM before soldering,
    - Double-check orientation of IC sockets before soldering (and of ICs themselves later before putting them in of course),
    - Double-check polarity of all polarized caps before soldering,
    - Double-check right pinout of transistors before soldering,
    - Basically double-check every component and every wire (right position, right value, right orientation) before soldering,
    - When all parts and jumpers are soldered and you are about to start putting the real ICs there for the first time, check yet before that expected voltages (especially GND and VCC) are at expected pins of all IC sockets (and vice versa).
    - Don't put all ICs there at once, fill them by functional blocks (LFO, clock, input buffer, BBD..) and check that given block works before filling another one.
11. **VCC = 10V max.** (MN3207 limitation)

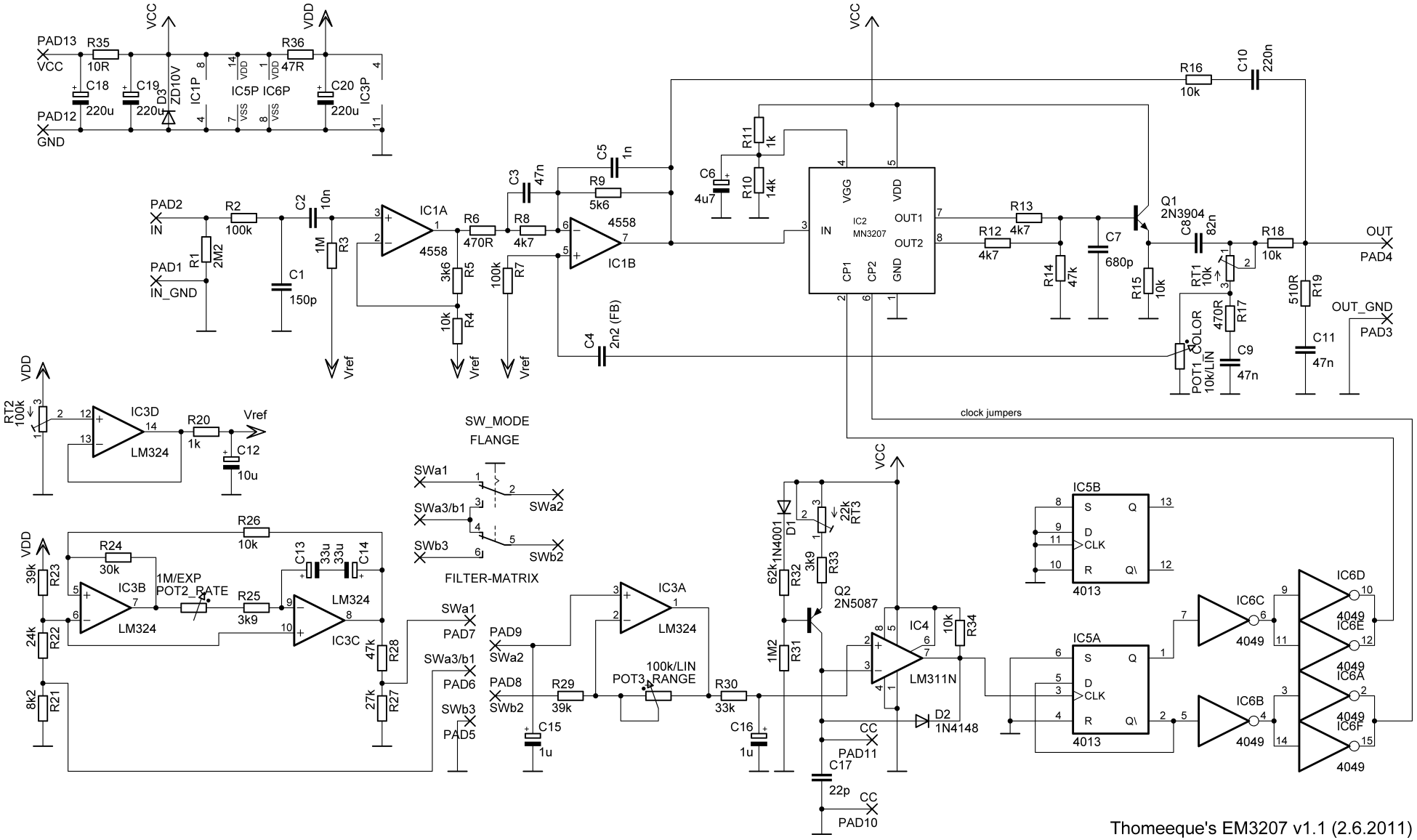
ALIGNMENT PROCEDURE

- *TODO*

ADVICED MODS

- Play with C4 (feedback cap) value to get your own COLOR.
- Play with C7 and C8 values to get darker or brighter wet signal character.
- Play with C17 (clock cap) to move wet signal delay range (bigger value will move you to darker flanger and more to chorus area). You may install SPDT on-off-on switch adding e.g. 22pF and 68pF caps in parallel to C17 (use CC wirepads).
- To adjust overall gain play with R5 value (A = 1 + R5/R4), but note that bigger gain at this point leads to lower dynamic range – use it only to get real unity gain, if default value does not work for you.

SCHEMATIC



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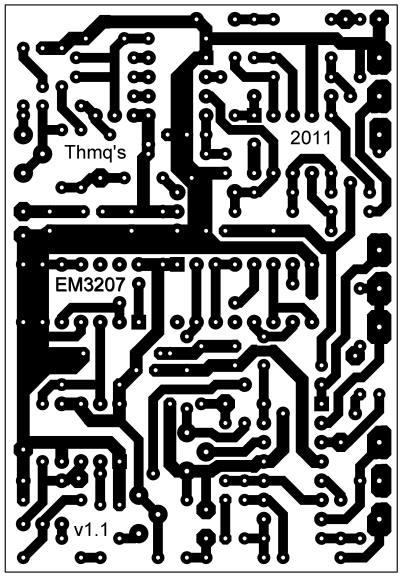
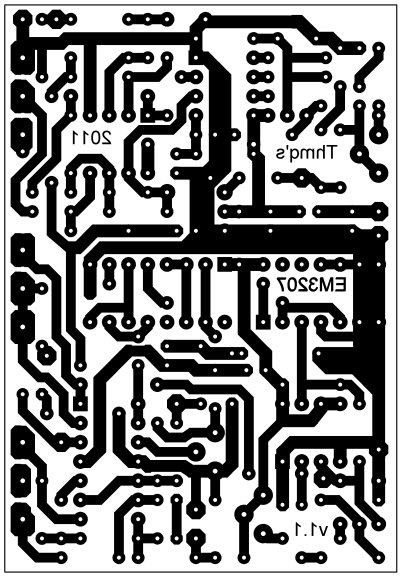
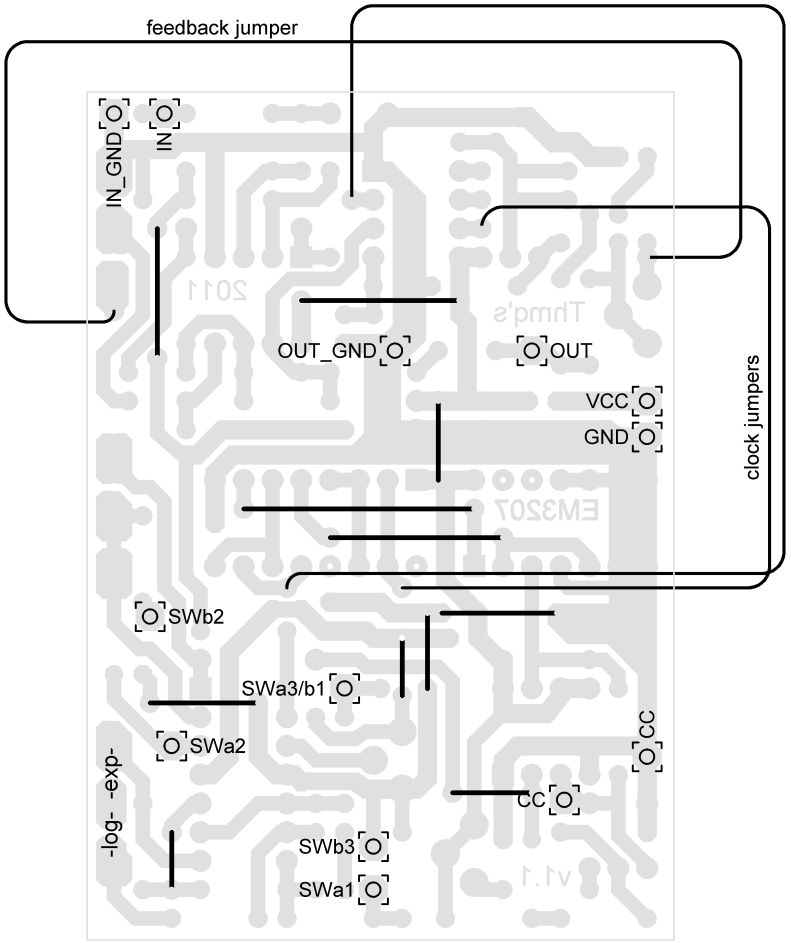
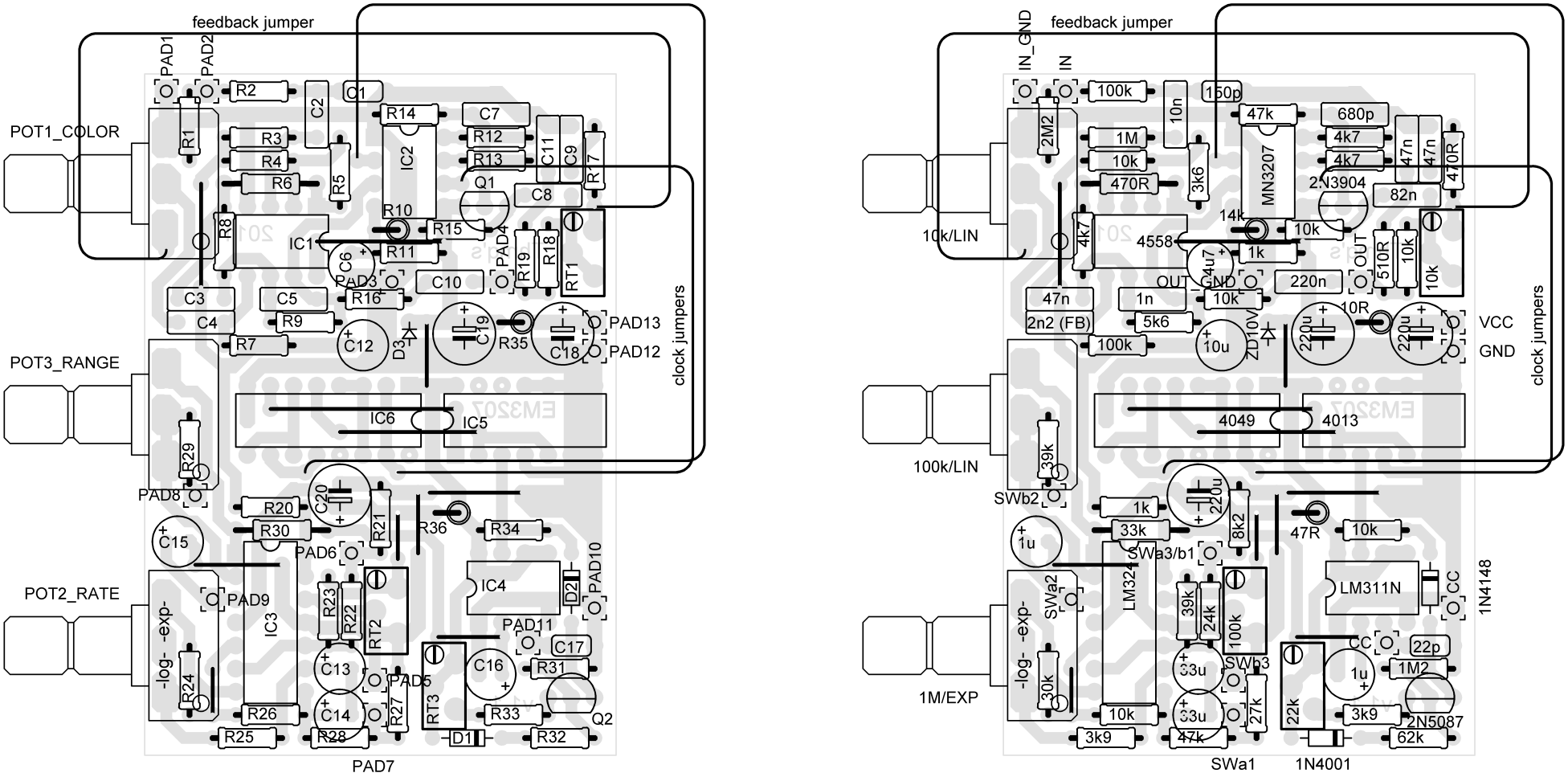
PCB 1:1 (NORMAL / MIRRORED), LAYOUT (WIREPADS & JUMPERS)







LAYOUT (NAMES / VALUES)



PART LIST

Note: All capacitors rated 16V or more

Resistors:

1x	10R	(R35)
1x	47R	(R36)
2x	470R	(R6, R17)
1x	510R	(R19)
2x	1k	(R11, R20)
1x	3k6	(R5)
2x	3k9	(R25, R33)
3x	4k7	(R8, R12, R13)
1x	5k6	(R9)
1x	8k2	(R21)
6x	10k	(R4, R15, R16, R18, R26, R34)
1x	14k	(R10)
1x	24k	(R22)
1x	27k	(R27)
1x	30k	(R24)
1x	33k	(R30)
2x	39k	(R23, R29)
2x	47k	(R14, R28)
1x	62k	(R32)
2x	100k	(R2, R7)
1x	1M	(R3)
1x	1M2	(R31)
1x	2M2	(R1)

Resistor Trimmers (Cermet T93YB):

1x	10k	(RT1)	
1x	22k	(RT3)	
1x	100k	(RT2)	*Precise multi-turn type*

Disc (Ceramic) Capacitors:

1x	22p	(C17)	*Clock cap*
1x	150p	(C1)	*RF filter*
6x	100n	-	*IC GND-VCC filtering, see build note 9.*

Foil Capacitors (RM5):

1x	680p	(C7)	
1x	1n	(C5)	
1x	2n2	(C4)	*Feedback cap*
1x	10n	(C2)	
3x	47n	(C3, C9, C11)	
1x	82n	(C8)	
1x	220n	(C10)	

Tantal Capacitors:

2x	1µ	(C15, C16)
1x	4µ7	(C6)
1x	10µ	(C12)
2x	33µ	(C13, C14)

Elyt Capacitors:

3x	220µ	(C18, C19, C20)

Diodes:

1x	1N4001	(D1)
1x	1N4148	(D2)
1x	Zenner 10V/5W	(D3)

Transistors:

1x	2N3904	(Q1)
1x	2N5087	(Q2)

ICs + sockets:

1x	CD4013B	(IC5, DIL14)
1x	CD4049B	(IC6, DIL16)
1x	JRC4558	(IC1, DIL8)
1x	LM311N	(IC4, DIL8)
1x	LM324	(IC3, DIL14)
1x	MN3207	(IC2, DIL8)

Potentiometers:

1x	100k/LIN	(POT3_RANGE)	
1x	10k/LIN	(POT1_COLOR)	
1x	1M/EXP	(POT2_RATE)	*EXP = reverse-audio, see build note 7.*

Switches:

1x	DPDT Toggle	(SW_MODE)