

EFM vcf2e with Modifications

I finally got around to assembling the vcf2e board I bought months ago, and thought I'd share some experience and some modifications.

First of all, this is a great sounding filter – nice Moog ladder sound. The onboard Envelope Generator and Envelope Follower are nice touches (way to go, Tom!)

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http://home.attbi.com/~sbernardi/elec/og2/og2_home.html

Errata

There was only one real mistake I found on the board: the inputs of U4:D (pins 12 and 13) are backwards. This will make the LFO mode not work (which I labeled **CYCLE** on my front panel). The traces looked pretty difficult to cut and rearrange (one was an itty bitty tiny thin thing), so I elected to add a transistor inverter after the opamp to provide the proper polarity. This can be seen on the ADSR schematic as D8*, R51*, Q14*, and R52* between point O and the S1:B of the LFO/CYCLE switch.

Modifications

Circuitry that I added is indicated with dotted lines around the components and asterisks on the component names.

ADSR

- My schematic shows the circuit with the full ADSR mods. This involves adding D9*, RV2*, R60*, RV1*, and D10* as shown on the ADSR schematic.
- I also decreased C18 to 3.3uF and R45 to 100 ohms to get shorter slopes on the fast end. The low value for the SUSTAIN pot (2K) also helps give a low minimum value for the DECAY slope. I actually used 2Meg log pots for ATTACK and RELEASE, and a 500K log for DECAY. You want log taper pots for the delays so you have finer resolution at the short end.
- It is very useful to have inverted envelope generator waveforms to control filters as this gives a very different sound. I added some circuitry to give inverted and non-inverted waveforms with continuously varying amplitude, controlled by the ENV RANGE pot. This is the circuitry built around U8 on the right of the ADSR schematic. I also brought an output from the envelope generator to a panel jack.

Filter

- I like to have the CV inputs on my filters track 1v/octave. To do this I changed R11 and R12 to 100K, and had to increase the T2 SCALE trimpot to 2K.

- A gotcha on the schematic: there are two possible places to put R16 on the schematic. If you have a 1K tempco resistor, it goes **underneath/inside** the 14 pin socket for the CA3046 (U6). Otherwise, there is another place for an R16 1K regular resistor next to the socket. Use one or the other. Actually, what I found is that increasing T2 through the temperature compensation off.
- I added a buffer with some amplification for the output of the filter to bring it up to the level of my other modules. This is U7*.

Trimming

V/OCTAVE

- T2 trims the v/octave scale. I found it would not trim to 1 v/octave without increasing T2.
- Set P1 (CUTOFF) to 0v and the INIT FREQ trimmer T1 to 0v. Do not connect an input signal.
- Turn the resonance control all the way up until the filter oscillates. Switch between 0v and 1v on one of your CV inputs (use your keyboard). The frequency should jump up an octave. Tweak on T2 until it sounds right. Or, you can use my VCO TUNER utility circuit to aid in tuning >>shameless plug!<<. See (http://home.attbi.com/~sbernardi/elec/og2/vco_tuner.html)

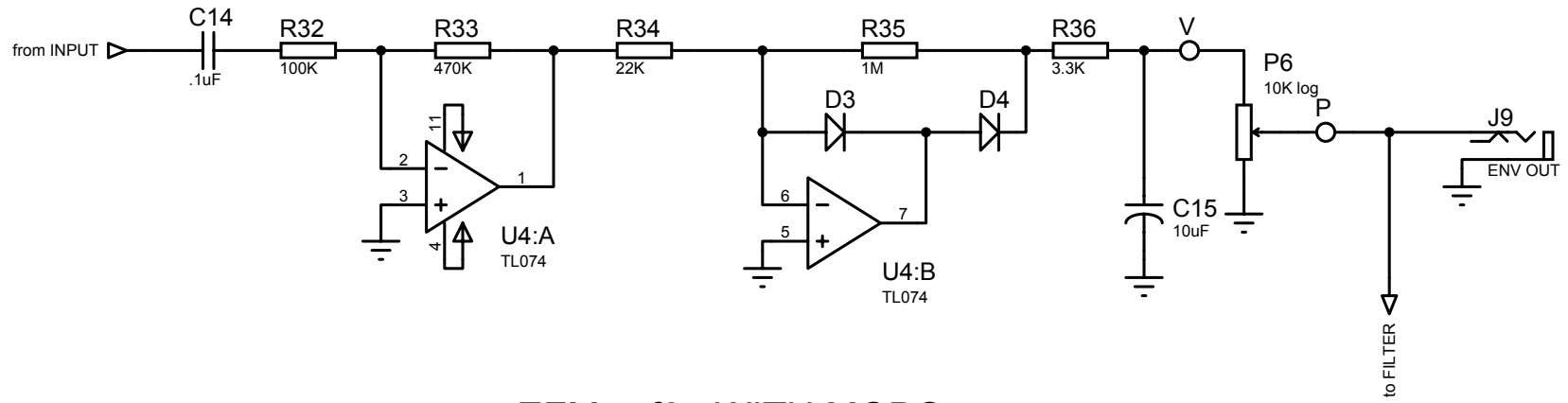
RESONANCE

- I found that turning T4 didn't seem to do much of anything.
- T3, labeled PEAK TRIM on Tom's schematic, is actually a trim for CV rejection of the resonance signal.
- With no audio input, adjust P2 RESONANCE so it is just under oscillation.
- If you have a scope: input a positive waveform (like from 0v to +5v) into the RES CV IN input. Put the scope on the filter output. Adjust T4 until the output is at a minimum amplitude.
- If you don't have a scope: input a repeating triggered ADSR waveform adjusted to fast rise and fall times (or a positive squarewave will work) into the RES CV IN input,. Listen to the output, and adjust T3 for the softest thump.

FREQ RANGE

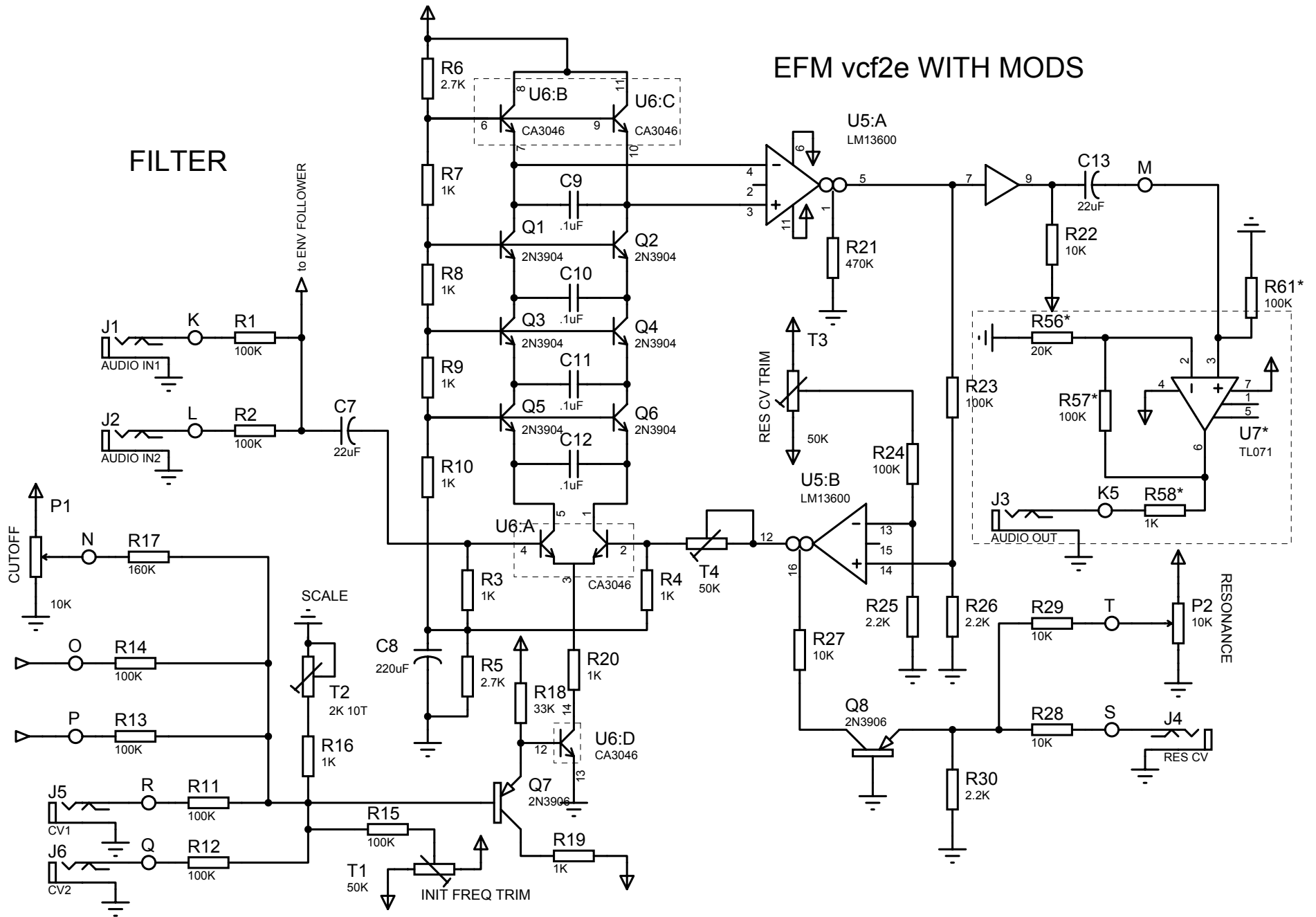
- With no audio input, adjust the RESONANCE control until the filter oscillates.
- Turn the CUTOFF control to minimum.
- Turn T1 way low until the output frequency is at the bottom of audibility.
- Turn the CUTOFF control until the frequency is at the top of what you can hear. Measure the voltage at the wiper of P1 (CUTOFF control), call it V1.
- Calculate a new value for R17: $12/V1 * 100K$. Mine came out to about 160K. Note that this is dependent on whether you did the tweaks to T2 like I did.

ENVELOPE FOLLOWER



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BILL OF MATERIALS (Default)

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Design: EFM vcf2e LADDER FILTER WITH MODS
 Revision: 1.1
 Author: Design by Tom Gamble, Mods by Scott Bernardi
 Created: 10/20/02
 Modified: 10/21/02

QTY	PART-REFS	VALUE
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Resistors

15	R1,R2,R11,R12,R13,R14,R15, R23,R24,R32,R48,R53*,R54*, R57*,R61*	100K
12	R3,R4,R7,R8,R9,R10,R16,R19, R20,R46,R58*,R59*	1K
3	R5,R6,R60*	2.7K
1	R17	160K
2	R18,R56*	20K
2	R21,R33	470K
8	R22,R27,R28,R29,R38,R39,R42, R52*	10K
5	R25,R26,R30,R41,R43	2.2K
2	R34,R51*	22K
1	R35	1M
1	R36	3.3K
2	R40,R49	4.7K
2	R44,R45	100

Capacitors

2	C7,C13	22uF
1	C8	220uF
5	C9,C10,C11,C12,C14	.1uF
1	C15	10uF
3	C16,C19,C20	.01uF
1	C17	100uF
1	C18	3.3uF

Integrated Circuits

1	U3	555 (CMOS type preferred)
1	U4	TL074
1	U5	LM13600 or LM13700
1	U6	CA3046
1	U7*	TL071
1	U8*	TL072

Transistors

10	Q1,Q2,Q3,Q4,Q5,Q6,Q10,Q11, Q12,Q14*	2N3904
2	Q7,Q8	2N3906

Diodes

7 D3, D4, D5, D6, D8*, D9*, D10* 1N4148

Switches

1 S1 DPDT SWITCH (CYCLE)

1 TRIGGER PUSHBUTTON N.O.

Jacks

1 J1 AUDIO IN1

1 J2 AUDIO IN2

1 J3 AUDIO OUT

1 J4 RES CV

1 J5 CV1

1 J6 CV2

1 J7 GATE IN

1 J8 E.G. OUT

1 J9 ENV OUT

Potentiometers

1 P1 10K (CUTOFF)

1 P2 10K (RESONANCE)

1 P3 1M log (ATTACK)

1 RV1* 1M log (RELEASE)

1 P4 500K log (DELAY)

1 P5 10K (E.G. LEVEL)

1 P6 10K log (ENV FOLLOWER LEVEL)

1 RV2* 2K (SUSTAIN)

1 T1 50K trimmer (INITIAL FREQUENCY)

1 T3 50K trimmer (RESONANCE CV REJECTION TRIM)

1 T4 50K trimmer (RESONANCE TRIM)

1 T2 2K 10T trimmer (SCALE)

EFM vcf2e Moog Ladder Filter



