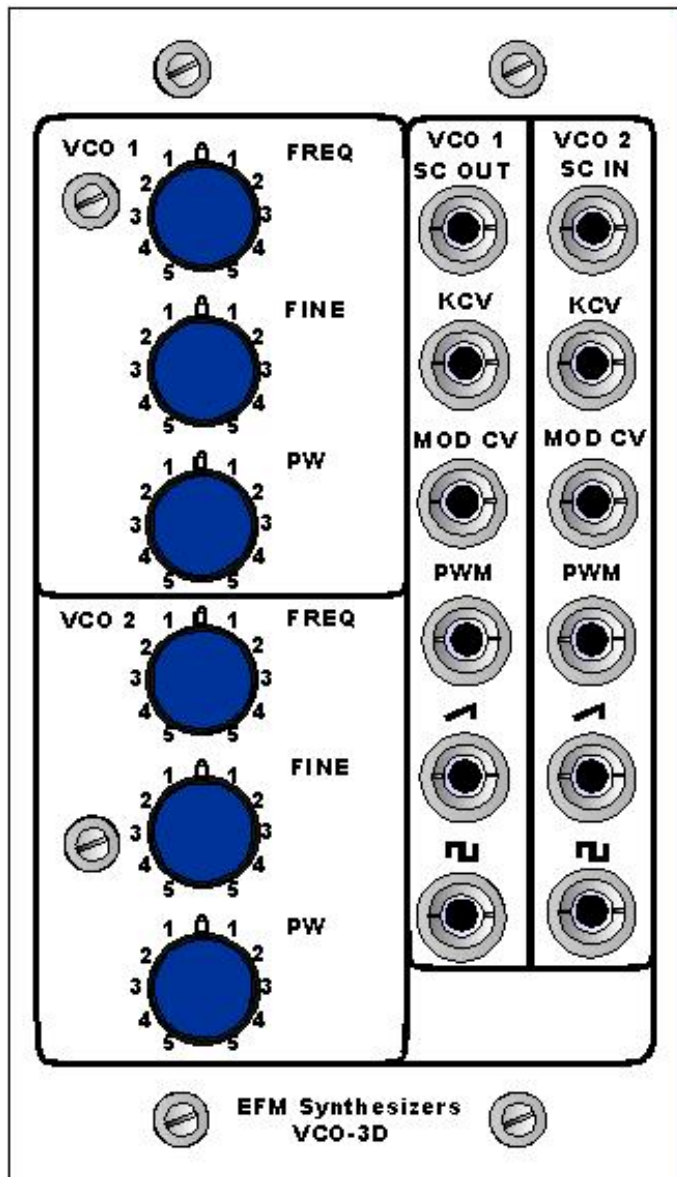


# EFM Synthesizers

## VCO 3D



Dual VCO based on the Moog Rogue oscillators. Features...

- Two wide range VCOs
- Saw and Variable PW
- Syncable
- On board chip heater may be disabled in favor of 1K tempcos
- +/-12 or +/- 15V

The VCO3d is supplied with tempco resistors however there is a chip-heater option on the board.

### Chip-Heater

To use the chip-heater option the three spaces on the board marked for TC, TC and TC-R are not used. All parts and jumpers are installed. Turn the unit on. After about five minutes warmup adjust trimmer R7 until U5 pins 5 and 6 are equal. About +0.67VDC.

### Tempco Resistors

To use the tempco option the three spaces on the board marked for TC , TC and TC-R are used.

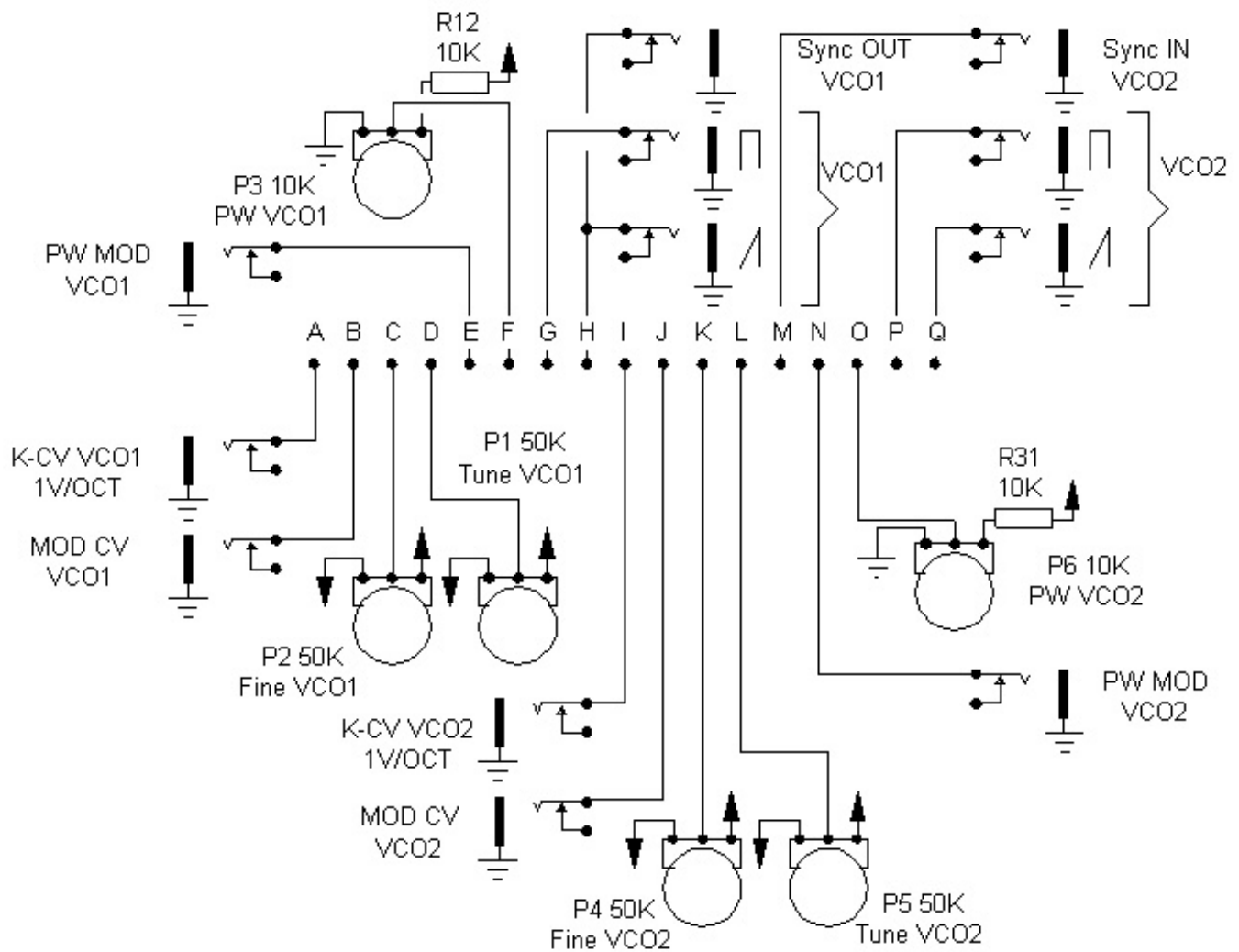
### Unused or changed parts

- Install (2) 1K tempco resistors for the spaces marked TC. Leave enough slack on the leads so that they can be placed in contact with the top U1. Use a little heat sink compound to insure good thermal contact.
- Install a 1K resistor for TC-R
- Omit R6, R40, R41, R42, R43, T-7
- Change R44 from 33-ohm to 10K
- Remove the tiny jumper to the left of TC-R that connects U1 pin-14 to +V
- Jump C8 (.01uF)

### Setup

You will need a way to generate keyboard control voltage, a tuning reference, monitor amplifier and a way to mix the vco outputs into the amp.

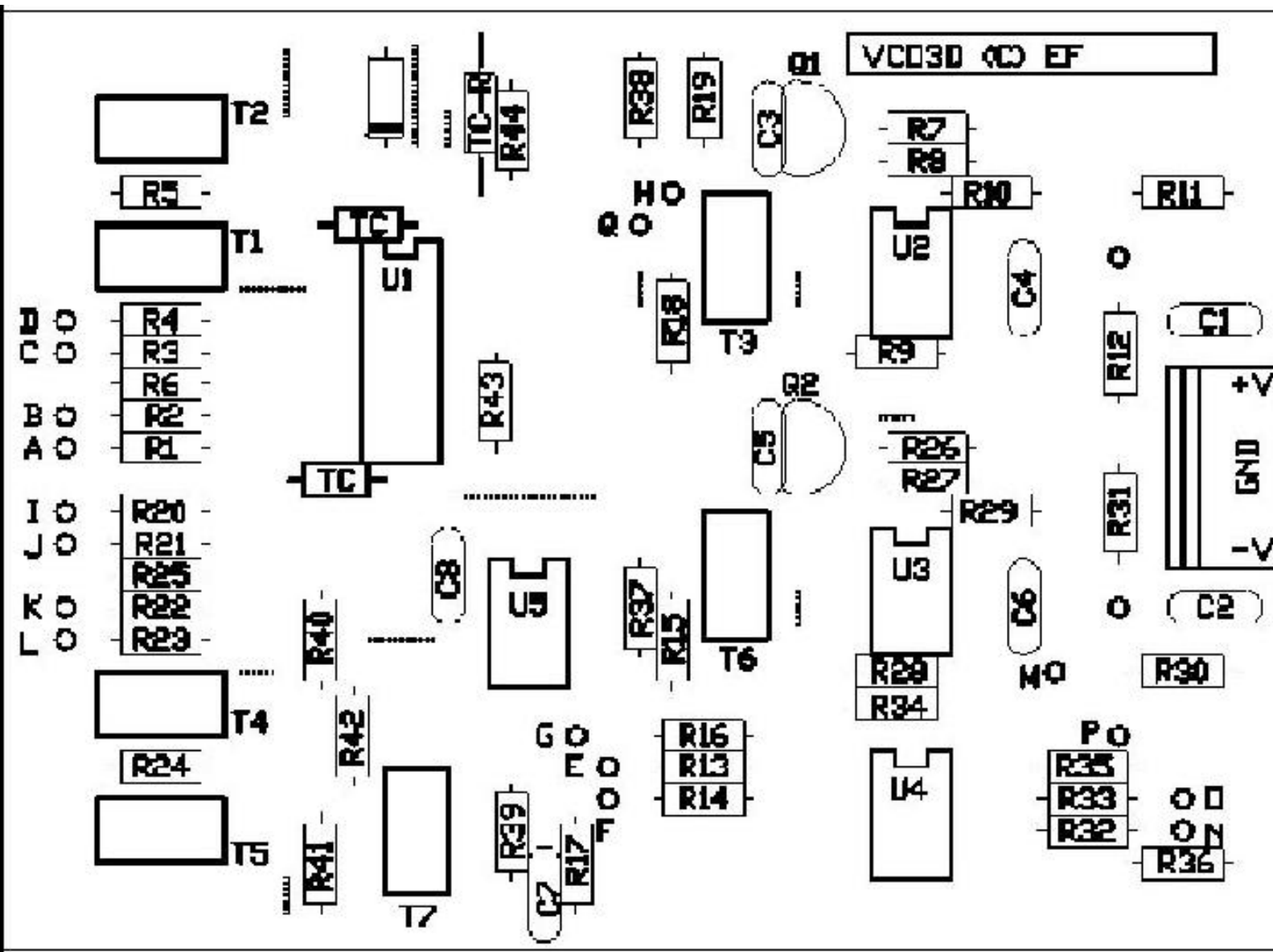
- Hook the saw output of VCO1 up to the monitor amplifier
- Hook your 1v/Oct controller to KCV-VCO1 and KCV-VCO2
- Turn on the amp and make sure that it's turned down
- Apply power to the vco board
- Turn the amp up to a reasonable level
- Turn Freq and Fine controls for both VCOs to 12 o'clock.
- Play the middle octave on your controller. Usually C4-C5.
- Adjust T2 until the VCO's middle C is close to the frequency of your reference keyboard.
- Play the C4-C5 octave and adjust T1 until the octave is correct.
- Play the highest octave on your keyboard and adjust T3 until the octave is correct
- Turn up the level on VCO2's output
- Play middle C and adjust T5 until the VCO's are close to the same frequency
- Turn the level on VCO1 down
- Play the C4-C5 octave and adjust T4 until the octave is correct.
- Play the highest octave on your keyboard and adjust T6 until the octave is correct
- Turn up the level on VCO1 to balance the oscillators outputs adjust VCO2 to match VCO1 as close as possible while checking your tuning reference.
- Wait for a while and do it all again to tighten thing up.

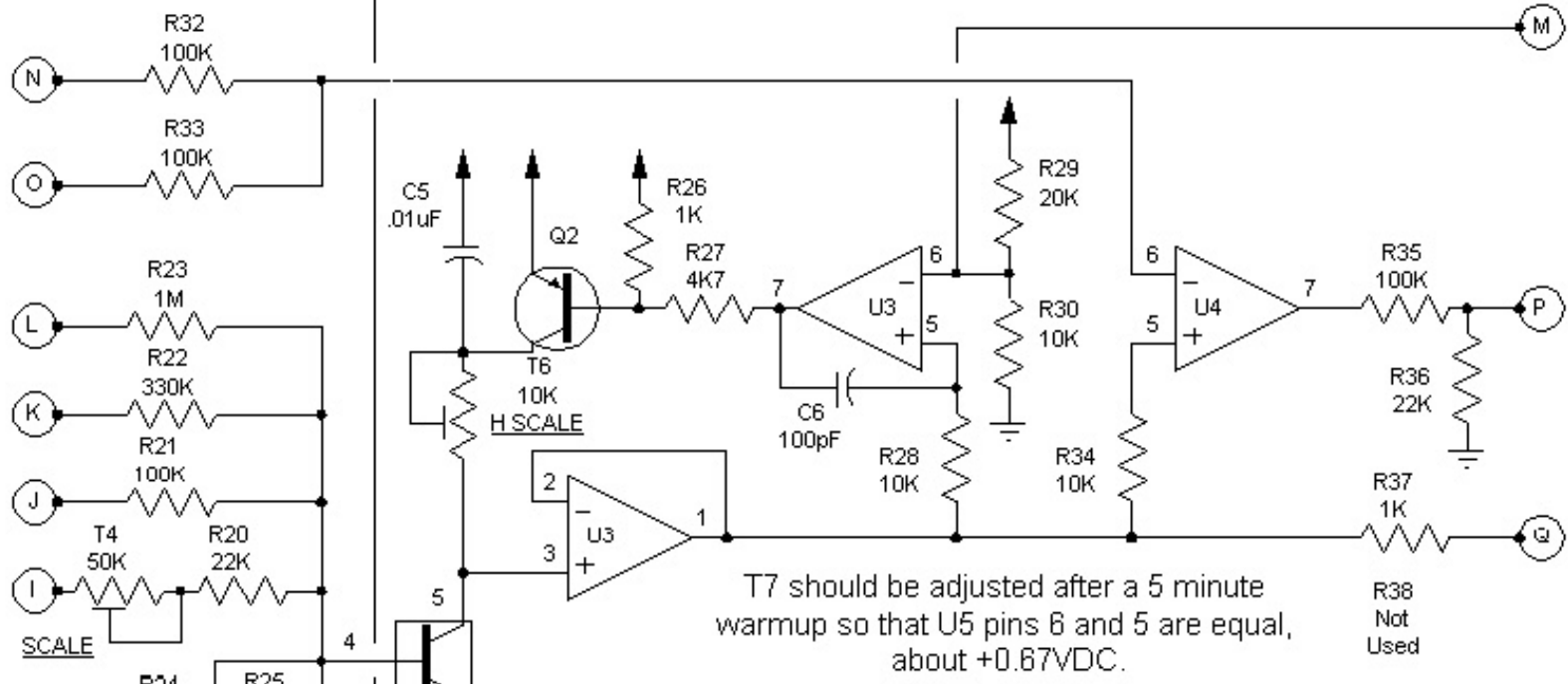
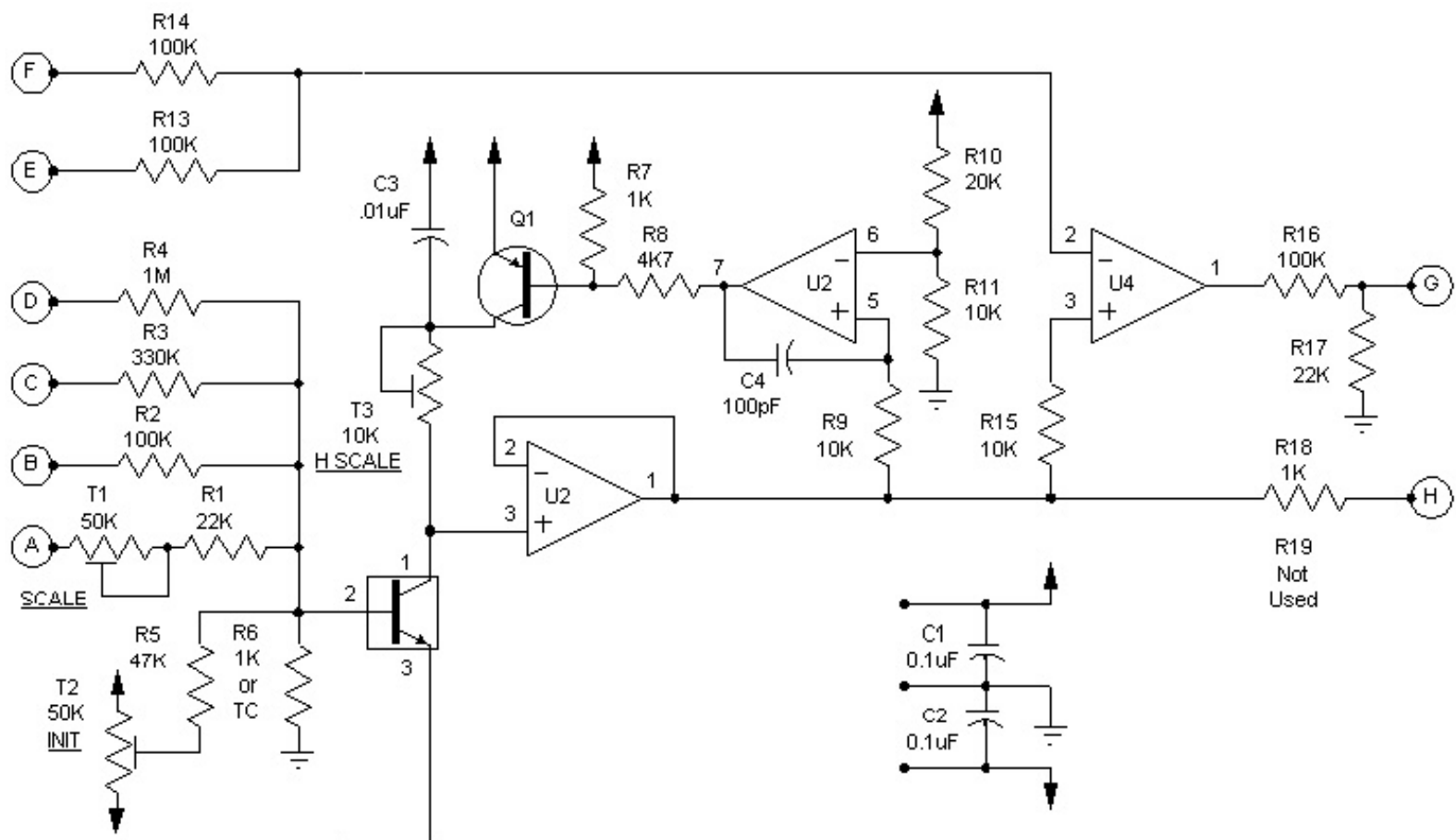


### Full Parts Kit

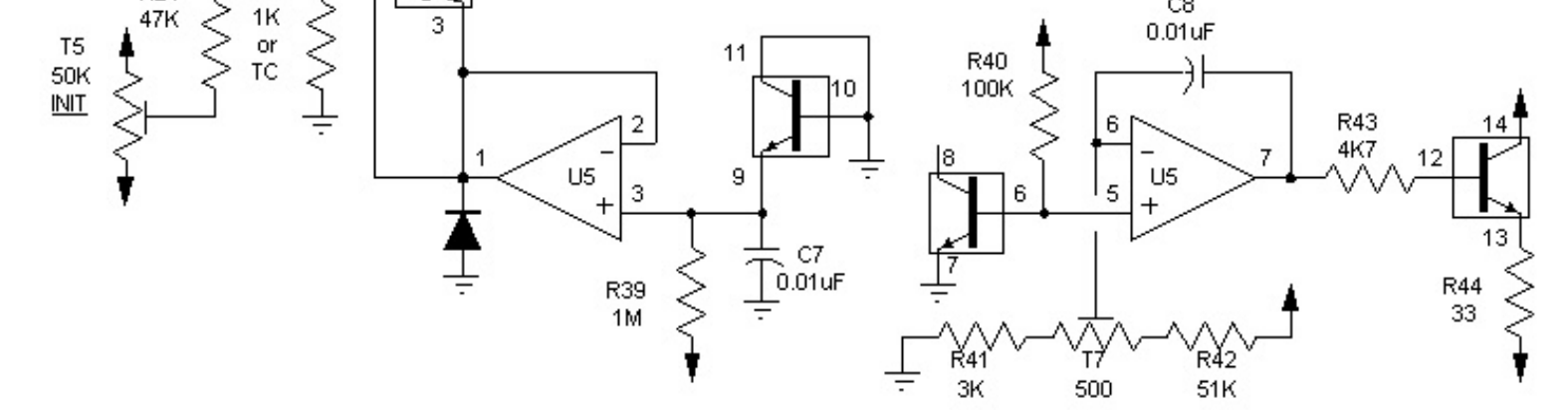
C1,C2,	0.1	2
C3,C5,C7,C8	0.01	4
C4,C6	100p	2
R1,R20	22K	2
R2,R19,R21,R25,R13,R14,R16		
R18,R21,R32,R33,R35,R37,R40	100K	14
R3,R22	330K	2
R5,R24,R42	47K	3
R6,R25	1K	3
R,R267	1K	2
R8,R27,R43	4.7K	3
R9,R11,R12,R15,R28,R30,R31,R34	10K	8
R10,R29	20K	2
R17,R36	2.2K	2
R4,R23,R39	1M	3
R41	3K	1
R42	51K	1
R44	33	1
D1	1N914	1
Q1,Q2	2N3906	2

U1	LM3046	1
U2,U3,U4,U5	TLO72	4
PC-Board		1
<b>Small Parts Kit</b>		
P1,P3	50K	6
Knobs		6
T4,T6	10K	4
T1,T3,T2,T5	50K	2
1/8 PHONE		12
L-Bracket		2
Power Connector		1
8 pin		4
14 pin		2
Panel		1
Overlay	Overlay	1

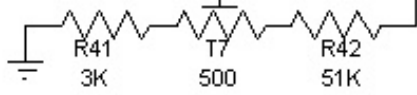




T7 should be adjusted after a 5 minute warmup so that U5 pins 6 and 5 are equal, about +0.67VDC.



1M



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